SPIE. SENSORS+ IMAGING

5–7 SEPTEMBER 2022 | ESTREL BERLIN HOTEL & CONGRESS CENTER
BERLIN, GERMANY

SPIE. SENSORS+ IMAGING

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.

Conferences: 5–7 September 2022
Exhibition: 6–7 September 2022

Estrel Berlin Hotel & Congress Center

Berlin, Germany

Download the
SPIE Conference and Exhibition App

Download the App to view the full schedule of events and participants. Get all the details on your mobile device.

» Plan your conference schedule and sync between your mobile device and desktop computer

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Get the App

Stay Connected

Safe meeting protocols

Masks recommended

Masks are recommended, but not required for all indoor spaces.

Keep a safe distance

Respect the personal space and comfort level of others.

Health and safety

SPIE requests that attendees are fully vaccinated as defined by their country of origin, or recovered from COVID and have a negative test. Please be prepared to show the relevant document.

Enhanced sanitation measures will be taken throughout the event

- Masks and hand sanitisers will be widely available for free
- Conference rooms will allow for social distancing to the extent possible

How we can all help

- Wash hands frequently
- Respect the personal space and comfort level of others
- Do not attend if you are not feeling well
- Be prepared and have a plan to quarantine if necessary, following guidelines from Travel Canada

We encourage you to get tested if required for travel, have known exposure, or have symptoms of COVID-19.

Travelling

For information on traveling, please visit the Hotel and Travel page.

RESOURCES:

- List of Vaccines accepted in Germany as approved by Paul Ehrlich Institute
- German Government advice for travellers to Germany
- EU Digital Covid Certificate for EU citizens

spie.org/esi
#SPIESensors

Welcome to SPIE Sensors + Imaging 2022

This year marks a new chapter in the evolution of these two long standing events: Remote Sensing and Security + Defence. Each meeting continues to be held as an individual symposium with its unique contributions, but from now on will be announced under the single event name of Sensors + Imaging.

These two unique symposia will offer opportunities to network with colleagues from a variety of disciplines in academia, industry, and government from all over the world, whilst still maintaining a distinctly European focus, both within the conference experience as well as the exhibition. SPIE Remote Sensing and Security + Defence will consider all aspects of the evolving fields of optronics and photonics.

We appreciate the continued support of our volunteers and our event leadership. The Organising Committees invite you to participate in this exciting meeting and to take the opportunity to learn about the latest scientific results within both symposia.

2022 Sensors + Imaging Symposium Chairs

Karin Stein
Security + Defence Chair
Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)

Ric Schleijpen
Security + Defence Co-chair
TNO Defence, Security and Safety (Netherlands)

Karsten Schulz
Remote Sensing Chair

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

Lorenzo Bruzzone
Remote Sensing Co-chair
Univ. degli Studi di Trento (Italy)

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OpTecBB

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European Association of Remote Sensing Companies
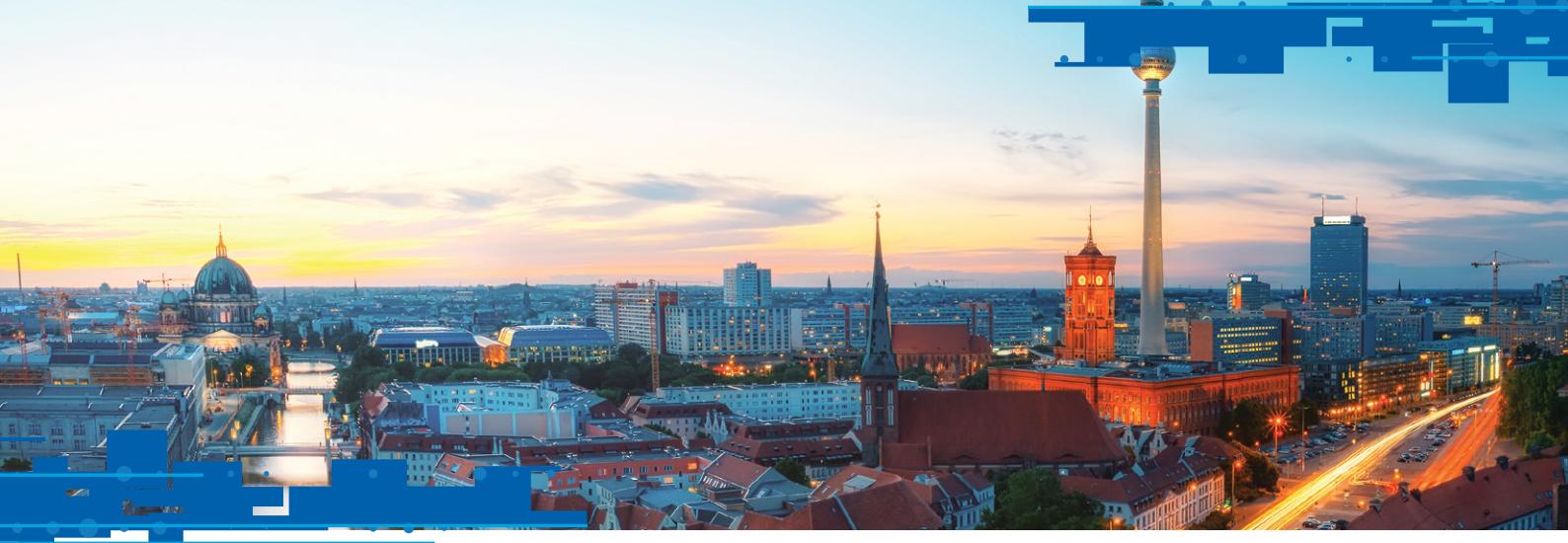
Experience the energy of Sensors + Imaging

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, and counterterrorism, and more. Attend technical presentations, free exhibition, plenary presentations, and a variety of networking activities.

SPIE Remote Sensing—PAGES 8-9

Sensor and photonic technologies for imaging and monitoring the Earth's atmosphere and environments.

TECHNICAL CONFERENCES—PAGES 12–30

SPIE Security + Defence—PAGES 10-11

Photonic technologies that address homeland security, defence, and counterterrorism.

TECHNICAL CONFERENCES—PAGES 31–44

Plenary Sessions—PAGE 8

Presentations by leading speakers from across the globe.

Technical Events—PAGE 9

Poster sessions, workshops, and networking with a technical focus.

Social and Networking Events—PAGE 9

Connect with colleagues in variety of ways throughout the week.

Exhibition—PAGES 12-17

The free exhibition will run 6–7 September 2022 offering a look at innovative technologies from detectors and sensors to lasers and imaging equipment.

Facility Map—PAGES 3–4

General Information—PAGE 52

SPIE Policies—PAGE 53

See full details and updates at spie.org/esi or on the SPIE App

ÜBERSICHT OVERVIEW

ESTREL CONGRESS CENTER (ECC)

26 ROTUNDE Rotunda

27 INNENHOF Inner courtyard

28 GALERIE CONVENTION HALL I
Gallery Convention Hall I

29 VIP GALERIE VIP gallery

30 KÜNSTLERGARDEROBEN (MEHRSTÖCKIG)
Artist dressing room (multistory)

31 ZULIEFERZONE CONGRESS CENTER
Delivery zone Congress Center

32 RAUM Room V (2.OG 2nd floor)

33 RAUM Room IV (2.OG 2nd floor)

34 RAUM Room III

35 RAUM Room II

36 RAUM Room I (1.OG 1st floor)

37 NEBENEINGANG
Side entrance

38 GALERIE CONVENTION HALL II
Gallery Convention Hall II

39 BACKSTAGE RÄUME 1–4
Backstage rooms 1–4 (2.OG 2nd floor)

40 LOUNGE RÄUME 1–3
Lounge rooms 1–3 (1.OG 1st floor)

41–46 RÄUME Rooms VI–XI (1.OG 1st floor)

47–50 RÄUME Rooms XII–XV (2.OG 2nd floor)

51 AUDITORIUM (1.–3.OG 1st floor–3rd floor)

52 WATERFRONT / SCHIFFSANLEGER Landing pier

53 OUTDOOR AREA

☐ HOTEL FLÜGEL I–IV Hotel wings I–IV

◼ KONFERENZBEREICH Conference area

◼ RESTAURANTS / GASTRONOMIE
Restaurant / Gastronomy
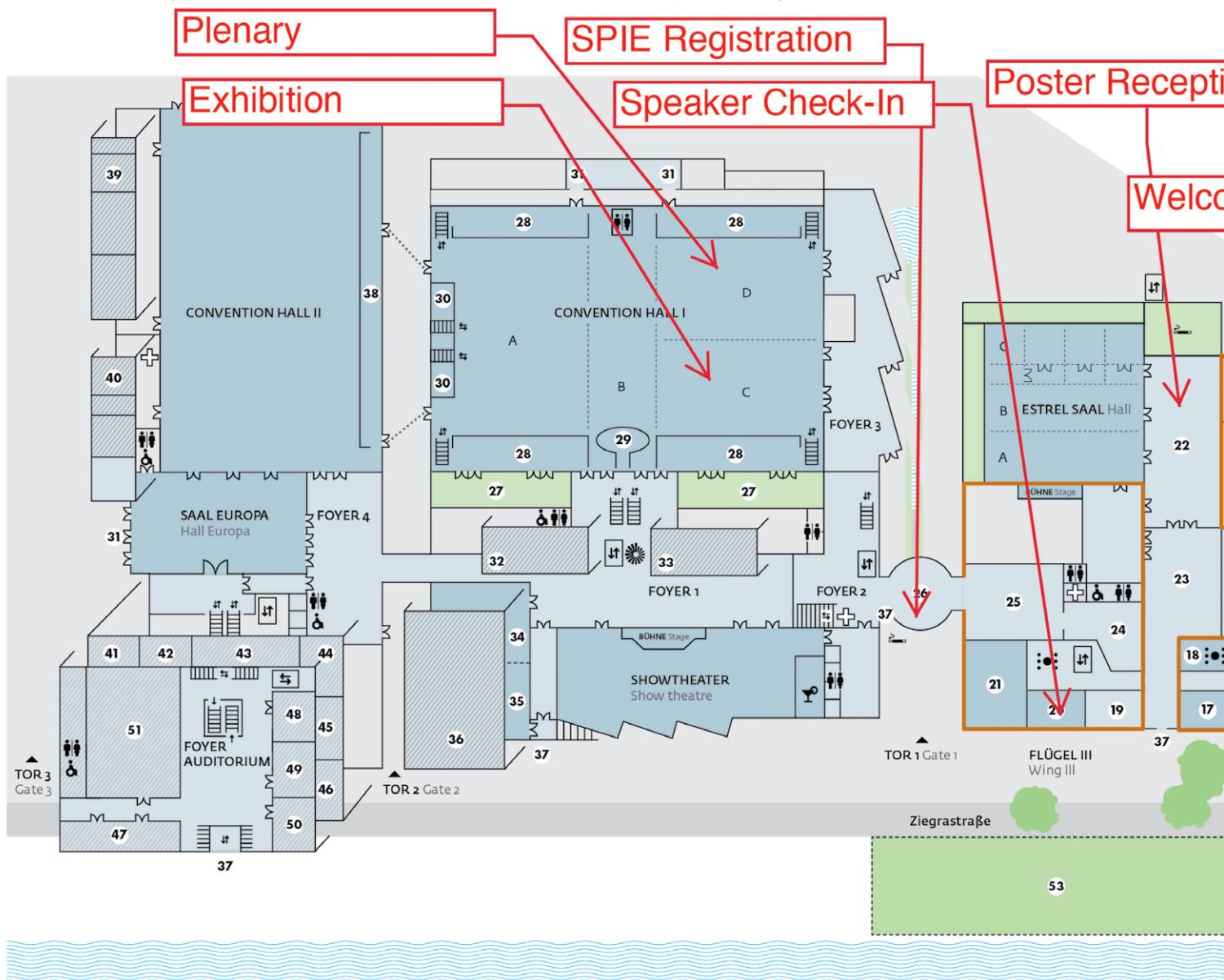
ESTREL HOTEL

01 ATRIUMBAR I
02 ESTREL PRIVÉE Private dining room
03 PORTOFINO – ITALIENISCHES RESTAURANT
Portofino – Italian restaurant
04 GRILL – STEAKHOUSE
05 CO-WORKING SPACE
06 ATRIUMBAR II
07 AUSSENTERRASSE
Outdoor terrace
08 ESTREL STUBE – DEUTSCHE KÜCHE
Estrel Stube – German cuisine
09 LA TERRASSE (1.OG 1st floor)
10 KONFERENZRAUM NIZZA
Conference room Nizza
11 KONFERENZRAUM CANNES
Conference room Cannes
12 KONFERENZRAUM ANTIBES
Conference room Antibes
13 KONFERENZRAUM SAINT TROPEZ
Conference room Saint Tropez
14 GEPÄCKRAUM Luggage room
15 REZEPTION Reception
16 CONCIERGE / HOTEL SHOP /
TICKETCOUNTER / CONGRESS-SERVICE
17 KONFERENZRAUM STRASSBURG
Conference room Straßburg
18 KONFERENZRAUM PASSAGE OFFICE
Conference room Passage Office
19 KLEINE GALERIE Small gallery
20 KONFERENZRAUM LYON
Conference room Lyon
21 KONFERENZRAUM PARIS
Conference room Paris
22 FOYER ESTREL SAAL Estrel Hall
23 PASSAGE ESTREL SAAL Passage Estrel Hall
24 GROSSE GALERIE Large gallery
25 ZUGANG ROTUNDE Passage to Rotunda
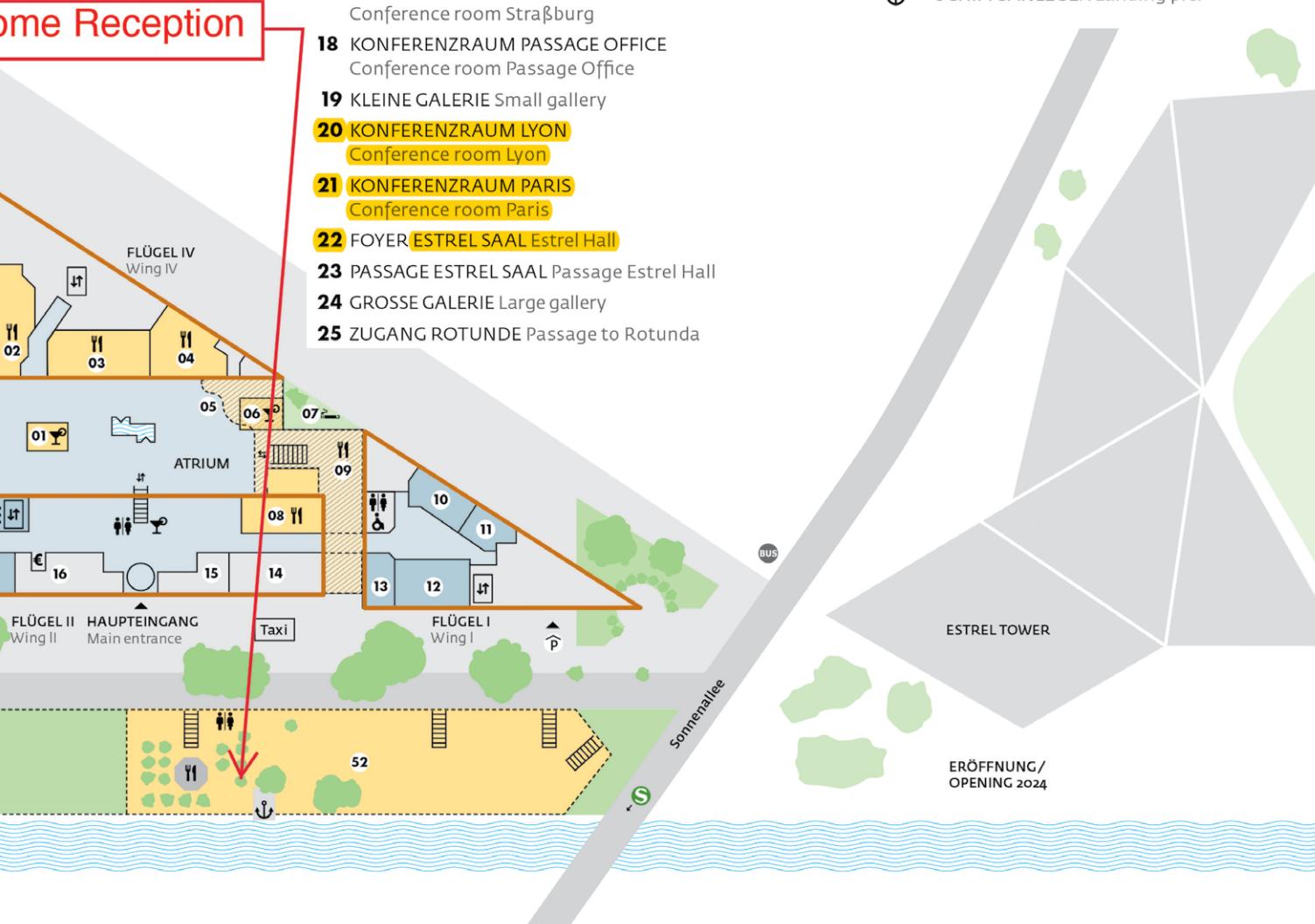
WEITERHIN FINDEN SIE In addition you find

FITNESS / WELLNESS
FLÜGEL Wing I (1.OG 1st floor)
EISWÜRFELMASCHINE Ice cube machine
FLÜGEL Wings II+IV (1.OG 1st floor)
FLÜGEL Wing III (2.OG 2nd floor)
NEW YORK BAR
FLÜGEL Wing II (UG Basement)

TOILETTEN Restrooms

RESTAURANTS / GASTRONOMIE
Restaurants / Gastronomy

BAR

AUFZUG Lift

WENDELTREPPE
Spiral staircase

RAUCHERBEREICH
Smokers area

€ GELDAUTOMAT ATM

ERSTE HILFE First aid

ZUGANG WEITERE MEETINGRÄUME
Access to additional Meeting rooms

SCHIFFSANLEGER Landing pier

on

me Reception

FLÜGEL IV
Wing IV

ATRIUM

FLÜGEL II
Wing II

HAUPTEINGANG
Main entrance

Taxi

FLÜGEL I
Wing I

52

Sonnenallee

ESTREL TOWER

ERÖFFNUNG /
OPENING 2024

Plenary sessions

Presentations by leading speakers from across the globe.

Open to all paid conference attendees.

Remote Sensing Plenary

5 September 2022 • 16:15–18:00

Join us for engaging plenary lectures by Sabine Chabrillat, GFZ German Research Centre for Geosciences and Leibniz Univ. Hannover (Germany), and Holger Krag, European Space Agency/ESOC (Germany).

16:15–16:30
Welcome Address and Plenary Speaker Introduction

16:30–17:15
The German Environmental Hyperspectral Satellite EnMAP: Mission Update and Related Science Activities

Sabine Chabrillat
GFZ German Research Centre for Geosciences and Leibniz Univ. Hannover (Germany)
17:15–18:00 hrs
The Space Debris Challenge: ESA's Answer

Holger Krag

European Space Agency/ESOC (Germany)

Security + Defence Plenary

7 September 2022 • 09:00–10:40

Come listen to fascinating lectures by Sabine Chabrillat, GFZ German Research Centre for Geosciences and Leibniz Univ. Hannover (Germany), and Holger Krag, European Space Agency/ESOC (Germany).

9:00–9:10
Welcome Address and Plenary Speaker Introduction

9:10–9:55
Directed Energy the Answer for the New Threats

Markus Jung
Rheinmetall Defence (Germany)

9:55–10:40
SWIR and MWIR Laser Sources for Optronics and Directed Energy

Marc Eichhorn
Fraunhofer IOSB and Karlsruhe Institute of Technology (Germany)

Technical events

Connect with your colleagues and explore topics in depth.

Open to all paid conference attendees.

Active vs Passive Threat Detection: Panel Discussion

6 September 2022 • 16:35–17:20

Join us for an insightful discussion addressing the implications of pre-launch vs post-launch threat detection.

MODERATORS:

Robert J. Grasso
NASA Goddard Space Flight Ctr. (United States)

David H. Titterton
UK Defence Academy (United Kingdom)

Poster Session: Tuesday

6 September 2022 • 17:30–19:00

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

Social and networking events

Connect with colleagues in variety of ways throughout the week.

Welcome Reception

5 September 2022 • 18:10–21:00
ESTREL, WATERFRONT (Number 52 on facility map)

Open to all registered attendees. Come network and socialize with your colleagues!

SPIE Remote Sensing

TIME	CONFERENCE 12262 **Remote Sensing for Agriculture, Ecosystems, and Hydrology XXIV** Chair: Christopher M. U. Neale; Antonino Maltese 5–6 September 2022 LOCATION: SAAL V	CONFERENCE 12263 **Remote Sensing of the Ocean, Sea Ice, Coastal Waters, and Large Water Regions 2022** Chairs: Charles R. Bostater Jr.; Xavier Neyt 6 September 2022 LOCATION: Estrel Hall C7	CONFERENCE 12264 **Sensors, Systems, and Next-Generation Satellites XXVI** Chairs: Sachidananda R. Babu; Arnaud Hélière; Toshiyoshi Kimura 6–7 September 2022 LOCATION: Saal II	CONFERENCE 12265 **Remote Sensing of Clouds and the Atmosphere XXVII** Chairs: Adolfo Comerón; Evgueni I. Kassianov; Klaus Schäfer; Richard H. Picard; Konradin Weber; Upendra N. Singh 5 September 2022 LOCATION: Estrel Hall C7
5 SEPTEMBER				
MORNING	SESSION 1: **UAV** SESSION 2: **Precision Farming and Smart Solutions for Farmers**			SESSION 1: **Radiative Transfer** SESSION 2: **Remote Sensing of Clouds, Aerosols, Trace Gases and Meteorological Parameters**
AFTERNOON	SESSION 3: **Forest and Agricultural Productivity**			SESSION 3: **Technologies, Techniques and Algorithms for Active and Passive Remote Sensing**
16:15	**REMOTE SENSING PLENARY** • Convention Hall I-D			
6 SEPTEMBER				
MORNING	SESSION 4: **Convolutional Neural Network and Decision Trees**	SESSION 1: **Water Surface Effects** SESSION 2: **Sub-surface Water Monitoring**	SESSION 1: **US Missions** SESSION 2: **European Missions**	
AFTERNOON	SESSION 5: **Machine Learning Classification** SESSION 6: **Deep Learning Classification**	SESSION 3: **Sensors for Water Monitoring**	SESSION 3: **Japanese Missions I** SESSION 4: **Japanese Missions II**	
17:30	**POSTER SESSION**			
7 SEPTEMBER				
09:00	**SECURITY + DEFENCE PLENARY** • Convention Hall I-D			
MORNING	SESSION 7: **Hydrology I**		SESSION 5: **Small Satellites**	
AFTERNOON	SESSION 8: **Hydrology II**		SESSION 6: **On-ground and In-orbit Calibration** SESSION 7: **Hyperspectral and Focal Plane Calibration**	

TIME	CONFERENCE 12266 **Environmental Effects on Light Propagation and Adaptive Systems V** Chairs: Karin Stein; Szymon Gladysz 6 September 2022 LOCATION: Estrel Hall A	CONFERENCE 12267 **Image and Signal Processing for Remote Sensing XXVIII** Chairs: Lorenzo Bruzzone; Francesca Bovolo; Jon Atli Benediktsson; Fabio Bovenga; Claudia Notarnicola; Nazzareno Pierdicca; Emanuele Santi 5–6 September 2022 LOCATION: Saal III	CONFERENCE 12268 **Earth Resources and Environmental Remote Sensing/GIS Applications XIII** Chairs: Karsten Schulz; Ulrich Michel; Konstantinos G. Nikolakopoulos 5–7 September 2022 LOCATION: Estrel Hall C6	CONFERENCE 12269 **Remote Sensing Technologies and Applications in Urban Environments VII** Chairs: Thilo Erbertseder; Nektarios Chrysoulakis; Ying Zhang 5 September 2022 LOCATION: Estrel Hall C5
5 SEPTEMBER				
MORNING		Welcome and Opening Remarks / SESSION 1: **Calibration, Image Enhancement and Water Marking** / SESSION 2: **Object Detection and Classification**	SESSION 1: **Sensors and Platforms**	SESSION 1: **Smart Cities** / SESSION 2: **Urban Planning**
AFTERNOON		SESSION 3: **Change Detection and Damage Assessment**	SESSION 2: **Environmental Monitoring Concepts**	SESSION 3: **Urban Air Quality and Climate**
16:15	**REMOTE SENSING PLENARY** • Convention Hall I-D			
6 SEPTEMBER				
MORNING	SESSION 1: **Experimental Characterization of the Atmosphere** / SESSION 2: **New Devices for Atmospheric Measurements**	SESSION 4: **Analysis of Hyperspectral and Multispectral Images** / SESSION 5: **Data Fusion, Watermarking and Radar**	SESSION 3: **Remote Sensing for Archaeology, Preservation of Cultural and Natural Heritage** / SESSION 4: **Satellite RS and Ground-based Nondestructive Technologies in Civil and Environmental Engineering I**	
AFTERNOON	SESSION 3: **Adaptive Optics** / SESSION 4: **Imaging through the Atmosphere**	SESSION 6: **SAR and Radar Data Analysis I** / SESSION 7: **SAR and Radar Data Analysis II**	SESSION 5: **Satellite RS and Ground-based Nondestructive Technologies in Civil and Environmental Engineering II** / SESSION 6: **Infrastructures and Urban Areas**	
17:30	**POSTER SESSION**			
7 SEPTEMBER				
09:00	**SECURITY + DEFENCE PLENARY** • Convention Hall I-D			
MORNING			SESSION 7: **Hazard Mitigation Geologic Applications I**	
AFTERNOON			SESSION 8: **Processing Methodologies** / SESSION 9: **Hazard Mitigation Geologic Applications II**	

SPIE Security + Defence

TIME	CONFERENCE 12270 **Target and Background Signatures VIII** Chairs: Karin Stein; Ric Schleijpen 5–6 September 2022 LOCATION: Paris	CONFERENCE 12271 **Electro-optical and Infrared Systems: Technology and Applications XIX** Chairs: Duncan L. Hickman; Helge Bürsing 6 September 2022 LOCATION: Estrel Hall C5	CONFERENCE 12272 **Electro-Optical Remote Sensing XVI** Chairs: Gary W. Kamerman; Ove Steinvall 6–7 September 2022 LOCATION: Estrel Hall C7	CONFERENCE 12273 **High-Power Lasers and Technologies for Optical Countermeasures** Chairs: David H. Titterton; Robert J. Grasso; Harro Ackermann; Willy L. Bohn; Mark A. Richardson 6–7 September 2022 LOCATION: Paris
5 SEPTEMBER				
MORNING	SESSION 1: **Camouflage Assessment** SESSION 2: **Scenes and Background**			
AFTERNOON	SESSION 3: **Material and Surface Properties**			
16:15	**REMOTE SENSING PLENARY** • Convention Hall I-D			
6 SEPTEMBER				
MORNING		SESSION 1: **Sensors and Systems** SESSION 2: **Modelling and Simulation**		
AFTERNOON		SESSION 3: **Technology in Germany** SESSION 4: **Image and Data Processing**	SESSION 1: **Signal Processing and Modeling I**	**Welcome and Introduction: Opening Remarks** SESSION 1: **Modelling and Simulation** SESSION 2: **Threats, Threat Detection and Threat Discrimination**
17:30	**POSTER SESSION**			17:05: PANEL DISCUSSION: **Active vs Passive Threat Detection**
7 SEPTEMBER				
09:00	**SECURITY + DEFENCE PLENARY** • Convention Hall I-D			
MORNING			SESSION 2: **Signal Processing and Modelling II**	SESSION 3: **Lasers and Sources**
AFTERNOON			SESSION 3: **Systems and Technology**	SESSION 4: **Quantum Cascade Lasers** SESSION 5: **Optics and Optical Systems** SESSION 6: **Laser Effects**

TIME	CONFERENCE 12274 **Emerging Imaging and Sensing Technologies for Security and Defence VII** Chairs: Gerald S. Buller; Richard C. Hollins; Robert A. Lamb; Martin Laurenzis; Neil A. Salmon; Frank Gumbmann; Roberto Zamboni; Chantal Andraud; Attila A. Szep; Paul M. Alsing; Michael L. Fanto; John G. Rarity; Andrea Camposeo; Luana Persano; Lynda E. Busse; Maria Farsari 5–7 September 2022 LOCATION: Saal IV	CONFERENCE 12275 **Counterterrorism, Crime Fighting, Forensics, and Surveillance Technologies VI** Chairs: Henri Bouma; Radhakrishna Prabhu; Robert James Stokes; Yitzhak Yitzhaky 5–6 September 2022 LOCATION: Estrel Hall C8	CONFERENCE 12276 **Artificial Intelligence and Machine Learning in Defense Applications IV** Chair: Judith Dijk 6–7 September 2022 LOCATION: Estrel Hall C8
5 SEPTEMBER			
MORNING	SESSION 1: **Single Photon Lidar**	SESSION 1: **CBRNE + Spectroscopy**	
	SESSION 2: **Single-Photon Imaging and Sensing**	SESSION 2: **Concealed, Remote Sensing, and Communication**	
AFTERNOON	SESSION 3: **Single- and Low-Photon Detection**	SESSION 3: **Identity and Document Verification**	
16:15	**REMOTE SENSING PLENARY** • Convention Hall I-D		
6 SEPTEMBER			
MORNING	SESSION 4: **Computational Imaging**	SESSION 4: **AI-based Surveillance and Detection**	
	SESSION 5: **Sensing Techniques**		
AFTERNOON	SESSION 6: **Quantum Technologies**		SESSION 1: **Security Applications**
	SESSION 7: **Millimetre Wave and Terahertz Sensors and Technology**		SESSION 2: **Annotation and Training**
			SESSION 3: **Object Detection**
17:30	**POSTER SESSION**		

7 SEPTEMBER			
09:00	**SECURITY + DEFENCE PLENARY** • Convention Hall I-D		
MORNING	SESSION 8: **Advanced Manufacturing Technologies for Micro- and Nanosystems**		SESSION 4: **Evaluation of AI Systems**
AFTERNOON	SESSION 9: **Optical Materials and Biomaterials Technology**		SESSION 5: **Aerial Imaging**
			SESSION 6: **Aerial Object Detection**

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CONFERENCE 12262

Monday–Wednesday 5–7 September 2022 • Proceedings of SPIE Vol. 12262

Remote Sensing for Agriculture, Ecosystems, and Hydrology XXIV

Conference Chairs: **Christopher M. U. Neale,** Univ. of Nebraska Lincoln (United States); **Antonino Maltese,** Univ. degli Studi di Palermo (Italy)

Programme Committee: **Alessandra Capolupo,** Politecnico di Bari (Italy); **María Patrocinio González-Dugo,** Instituto de Investigación y Formación Agraria y Pesquera (Spain); **Antonino Maltese,** Univ. degli Studi di Palermo (Italy); **Christopher M. U. Neale,** Univ. of Nebraska Lincoln (United States)

MONDAY 5 SEPTEMBER

SESSION 1

LOCATION: SAAL V . . . . MON 9:00 TO 10:20

UAV

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

9:00: **Snapshot imaging spectrometers for environmental imaging**, Tomasz S. Tkaczyk, Rice Univ. (United States). . . . . [12262-1]

9:20: **Unmanned aerial vehicle aerodynamics performance optimization using variable Cant angle**, Ali J. Al-Khafaji, Gennady Panatov, Anton S. Boldyreff, Southern Federal Univ. (Russian Federation) . . . . [12262-2]

9:40: **Water volume monitoring of typical lakes on the Qinghai-Tibet Plateau based on multi-source satellite remote sensing data**, Xiongfei Wen, Zhe Chen, Daxiang Xiang, Changjiang River Scientific Research Institute (China); Xisheng Liu, Gang Wang, Qinghai Ctr. of Hydrology and Water Resource Survey and Forecasting (China) . . . . [12262-3]

10:00: **Design of an active laser-induced fluorescence observation system from unmanned aerial vehicles for artificial seed-like structures**, Hasib Mustafa, Haris Ahmad Khan, Harm Bartholomeus, Lammert Kooistra, Wageningen Univ. & Research (Netherlands) . . . . [12262-4]

Coffee Break. . . . . Mon 10:20 to 10:50

SESSION 2

LOCATION: SAAL V . . . . MON 10:50 TO 12:30

Precision Farming and Smart Solutions for Farmers

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

10:50: **Visually assessing maize leaves: from spectral sampling to high-fidelity color reproduction** , Gladimir V. G. Baranoski, Univ. of Waterloo (Canada) . . . . [12262-6]

11:10: **Chromatic and numerical approaches for the monitoring of corn plants under moderate water stress**, Gladimir V. G. Baranoski, Univ. of Waterloo (Canada) . . . . [12262-5]

11:30: **Evaluation of Phenocam phenology of barley**, Dessislava Ganeva, Milen Chanev, Lachezar Filchev, Georgi Jelev, Space Research and Technology Institute (Bulgaria); Darina Valcheva, Institute of Agriculture Karnobat, Agricultural Academy - Bulgaria (Bulgaria) . . . . [12262-7]

11:50: **Calculating the components of the total water supply at local scale for crop production using earth observation data assimilation**, Shirin Moradi, David Mengen, Harry Vereecken, Carsten Montzka, Forschungszentrum Jülich GmbH (Germany). [12262-8]

12:10: **Evaluating Sentinel-1 and Sentinel-2's ability to identify winter cover crops in the Republic of Ireland**, Mohana Priya Logakrishnan, Jesko Zimmermann, Stuart Green, Teagasc (Ireland) and Terrain AI (Ireland) . . . . [12262-47]

Lunch Break . . . . Mon 12:30 to 13:40

SESSION 3

LOCATION: SAAL V . . . . MON 13:40 TO 15:20

Forest and Agricultural Productivity

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

13:40: **Chime applications, societal challenges and economic benefits**, Elisabetta Lamboglia, European Space Agency (Netherlands) . . . . . [12262-9]

14:00: **Spatiotemporal dynamics of forest productivity in western Himalayan region**, Keshav Tyagi, Forest Research Institute (India) . [12262-10]

14:20: **Impact of soil moisture on agricultural productivity: Illinois case study**, Rajat Bindlish, NASA Goddard Space Flight Ctr. (United States) . . . . [12262-11]

14:40: **Crop area mapping in rice and yield estimation for crop insurances assimilating time-series SAR satellite data and crop growth model**, Pazhanivelan Sellaperumal, Ragunath Kaliyaperumal, Sudarmanian N.S., Kumaraperumal R., Tamil Nadu Agricultural Univ. (India); Jochen Ramcke, Manoj K. Yadav, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (India). . . . . [12262-12]

15:00: **Monitoring methane emission using remote sensing and DNDC model in major rice growing areas of Tamil Nadu**, Sudarmanian N.S., Pazhanivelan Sellaperumal, Ragunath Kaliyaperumal, Kumaralperumal R., Tamil Nadu Agricultural Univ. (India); Manoj K. Yadav, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (India). . . . . [12262-13]

Coffee Break. . . . . Mon 15:20 to 16:15

REMOTE SENSING PLENARY

LOCATION: CONVENTION HALL I-D . . . . 16:15 TO 18:00

16:15 to 16:30: **Welcome Address and Plenary Speaker Introduction**
Karsten Schulz, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

16:30: **The German environmental hyperspectral satellite EnMAP: mission update and related science activities** *(Plenary)*
Sabine I. Chabrillat, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ (Germany) and Leibniz Univ. Hannover (Germany)

17:15: **The space debris challenge: ESA's answer** *(Plenary)*
Holger Krag, European Space Operations Ctr. (Germany

TUESDAY 6 SEPTEMBER

SESSION 4

LOCATION: SAAL V . . . . TUE 10:30 TO 11:50

Convolutional Neural Network and Decision Trees

Session Chair: **Alessandra Capolupo**, Politecnico di Bari (Italy)

10:30: **Characterizing agri-forestry systems in Portugal through high-resolution orthophotos and convolutional neural networks**, Tiago Morais, Tiago Domingos, Ricardo Teixeira, Instituto Superior Técnico (Portugal) . . . . [12262-14]

10:50: **Digital soil mapping of soil taxonomy class information using decision tree approach**, Kumaraperumal Ramalingam, Muthumanickam D., Pazhanivelan Sellaperumal, Ragunath Kaliyaperumal, Tamil Nadu Agricultural Univ. (India); Jochen Ramcke, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (Germany). . . . . [12262-15]

11:10: **Image visibility filter-based dense convolutional neural network for diagnosing leaf diseases of rice**, Akshay Pandey, Kamal Jain, Indian Institute of Technology Roorkee (India). . . . . [12262-16]

11:30: **Predicting the variability of dam water levels with land-use and climatic factors using random forest and vector autoregression models**, Yashon O. Ouma, Ditiro Moalahi, George Anderson, Boipuso Nkwae, Phillimon Odirile, Univ. of Botswana (Botswana); Bhagabat Parida, Botswana International Univ. of Science & Technology (BIUST) (Botswana); Nako Sebusang, Tallman Nkgau, Univ. of Botswana (Botswana); Jiaguo Qi, Michigan State Univ. (United States) . . . . [12262-17]

Lunch/Exhibition Break . . . . Tue 11:50 to 13:20

SESSION 5

LOCATION: SAAL V . . . . TUE 13:20 TO 15:00

Machine Learning Classification

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

13:20: **Combining OBIA approach and machine learning algorithm to extract photovoltaic panels from Sentinel-2 images automatically**, Claudio Ladisa, Alessandra Capolupo, Politecnico di Bari (Italy); Maria Nicolina Ripa, Univ. degli Studi della Tuscia (Italy); Eufemia Tarantino, Politecnico di Bari (Italy). . . . . [12262-18]

13:40: **Detection and classification of changes in agriculture, forest, and shrublands for land cover map updating in Portugal**, Hugo Costa, Pedro José Benevides, Francisco D. Moreira, Mário R. Caetano, Direção-Geral do Território (Portugal). . . . . [12262-19]

14:00: **Mapping annual crops in Portugal with Sentinel-2 data**, Pedro J. Benevides, Direção-Geral do Território (Portugal); Hugo Costa, Direção-Geral do Território (Portugal) and NOVA Information Management School (Portugal); Francisco D. Moreira, Direção-Geral do Território (Portugal); Mário R. Caetano, Direção-Geral do Território (Portugal) and NOVA Information Management School (Portugal). . . . . [12262-20]

14:00: **Tree species classification based on machine learning techniques: ma2ping Chir pine in Indian western Himalayas**, Harshi Jain, Forest Research Institute (India) . . . . [12262-21]

14:40: **Classification of soil suitability in arid and semi-arid regions using machine learning methods**, Maryem Ismaili, Samira Krimissa, Mustapha Namous, Univ. Sultan Moulay Slimane (Morocco); Tarik Benabdelouahab, National Agronomic Research Institute (Morocco). . . . . [12262-22]

Coffee Break. . . . . Tue 15:00 to 15:30

SESSION 6

LOCATION: SAAL V . . . . TUE 15:30 TO 17:30

Deep Learning Classification

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

15:30: **Predicting household water supply using satellite imagery and deep learning**, Sven Wöhrle, Gernot Heisenberg, Technische Hochschule Köln (Germany); Roberto Ivo da Rocha Lima Filho, Univ. Federal do Rio de Janeiro (Brazil) . . . . [12262-23]

15:50: **Evaluation of remote sensing data using deep learning techniques for monthly runoff simulation in a mountain region**, Karima Nifa, Abdelghani Boudhar, Hamza Ouatiki, Univ. Sultan Moulay Slimane (Morocco); Bouchra Bargam, Abdelghani Chehbouni, Mohammed VI Polytechnic Univ. (Morocco) . . . . [12262-24]

16:10: **Remote sensing and deep learning techniques for impact assessment of Shaheen cyclone on vegetation cover at Al Batinah Governorate of Oman**, Yaseen Al-Mulla, Krishna Parimi, Mohammed Bait Suwailam, Sultan Qaboos Univ. (Oman) . . . . [12262-25]

16:30: **Fusion of SAR and multispectral images for rapid flood mapping based on deep learning method**, Zhe Chen, Ying Jiang, Jing Zhao, Daxiang Xiang, Xiongfei Wen, Yibang Wu, Jingwei Li, Changjiang River Scientific Research Institute (China) . . . . [12262-26]

16:50: **Supervised detection of Alternaria solani on ultra-high resolution modified RGB UAV images**, Jana Wieme, Univ. Gent (Belgium) and Flanders Research Institute for Agriculture, Fisheries and Food (Belgium); Sam Leroux, Univ. Gent (Belgium); Simon Cool, Flanders Research Institute for Agriculture (Belgium); Jan Pieters, Wouter Maes, Univ. Gent (Belgium). . . . . [12262-27]

17:10: **Deep learning based windthrow detection for winter storms**, Nishant Jaiswal, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany) and Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Tilman Bucher, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Jürgen Seiler, Friedrich-Alexander-Univ. Erlangen-Nürnberg (Germany); Philip Beckschäfer, Nordwestdeutsche Forstliche Versuchsanstalt (Germany); Protim Bhattacharjee, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . [12262-28]

POSTER SESSION

LOCATION: FOYER ESTREL SAAL ESTREL HALL. . . . . 17:30 TO 19:00

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 AM–17:00 hrs

View poster presentation guidelines and set-up instructions at https://spie.org/conferences-and-exhibitions/sensors-and-imaging/presenters/prepare-to-present/poster-presentation-guidelines

Water quality monitoring in an estuary using UAV hyperspectral imaging and satellite algorithms, Marija Kvesic, Morena Galesic Divic, Mak Kišević, Toni Kekez, Marin Miletic, Roko Andricevic, Univ. of Split (Croatia) . [12262-37]

Identifying sabkha land surfaces in the emirate of Abu Dhabi using earth observation techniques, Shaikha Al Besher, Mohammed Bin Rashid Space Ctr. (United Arab Emirates) . . . . [12262-38]

Comparison of active thermography techniques for copper detection on plants, Massimo Rippa, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", CNR (Italy); Valerio Battaglia, Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (Italy); Rossella Curcio, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", CNR (Italy); Michele Cermola, Ernesto Lahoz, Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (Italy); Pasquale Mormile, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", CNR (Italy) . . . [12262-39]

Potential groundwater detection and water flow simulation for Wadi Wurayah in the United Arab Emirates, Fatima Al Marzouqi, Mohammed Bin Rashid Space Ctr. (United Arab Emirates) . . . . [12262-40]

Development of four GIS models of empirical methods computing daily mean reference evapotranspiration (ETo) with MODIS LST inputs, Stavroula Dimitriadou, Konstantinos G. Nikolakopoulos, Univ. of Patras (Greece). . . . . [12262-41]

Infrared multispectral monitoring of cereal crops, Massimo Rippa, Rossella Curcio, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", CNR (Italy); Ida Di Mola, Lucia Ottaiano, Univ. degli Studi di Napoli Federico II (Italy); Eugenio Cozzolino, Consiglio per la ricerca in agricoltura e l'analisi dell'economia agraria (Italy); Mauro Mori, Univ. degli Studi di Napoli Federico II (Italy); Pasquale Mormile, Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello", CNR (Italy). . . . . [12262-42]

Estimation of tomato leaf area based on point cloud data using an RGBD camera, Hiroshi Okumura, Tomohiko Fuchida, Nobuhiko Yamaguchi, Osamu Fukuda, Munehiro Tanaka, Saga Univ. (Japan). . . . . [12262-43]

Spatial downscaling simulation of monthly precipitation based on TRMM 3B43 data in the Qilian Mountain, Gang Wang, Qinghai Ctr. of Hydrology and Water Resource Survey and Forecasting (China); Lijuan Fan, Haidong Water Conservancy Bureau (China); Lu Shi, Cuoji Nan, Qijiang Li, Qinghai Ctr. of Hydrology and Water Resource Survey and Forecasting (China) . [12262-44]

Spatial distribution assessment of seagrass meadows in the Canary Islands, Enrique J. Casas-Mas, Manuel Arbelo, Univ. de La Laguna (Spain); Laura Martin-Garcia, Instituto Español de Oceanografía (Spain); José A. Moreno-Ruíz, Univ. de Almería (Spain) . . . . [12262-45]

Comparison of spatial and temporal resolution of satellite images for monthly NDVI composite in high-altitude cabbage fields, Sunhwa Kim, UST21 (Korea, Republic of) . . . . [12262-46]

Two-source energy balance modeling of evapotranspiration with thermal remote sensing at different spatial resolutions: a case study of the European Alps, Paulina Bartkowiak, Mariapina Castelli, Eurac Research (Italy); Roberto Colombo, University of Milano-Bicocca (Italy); Claudia Notarnicola, Eurac Research (Italy) . . . . [12262-49]

WEDNESDAY 7 SEPTEMBER

SECURITY + DEFENCE PLENARY

LOCATION: CONVENTION HALL I-D . . . . **9:00 TO 10:40**

9:00 to **Welcome Address and Plenary Speaker Introduction**
9:10: **Karin Stein,** Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

9:10: **Directed energy, the answer for the new threats** *(Plenary)*
Markus Jung, Rheinmetall Waffe Munition GmbH (Germany)

9:55: **SWIR and MWIR laser sources for optronics and directed energy** *(Plenary)*
Marc Eichhorn, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) and Karlsruhe Institute of Technology (Germany)

Coffee Break. . . . . Wed 10:40 to 11:00

SESSION 7

LOCATION: SAAL V . . . . **WED 11:00 TO 12:20**

Hydrology I

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

11:00: **Evaluation of TRMM satellite data in hydrological HECHMS model in the upper reaches of the Oum Er-Rbia River, Morocco**, Elhousna Faouzi, Abdelkrim Arioua, Univ. Sultan Moulay Slimane (Morocco); Mohammed Hssaisoune, Univ. Ibn Zohr (Morocco); Abdelghani Boudhar, Hamza Ouatik, Abdenbi El Alaoui, Ismail Karaoui, Univ. Sultan Moulay Slimane (Morocco) . . . . [12262-29]

11:20: **Applicability of SWOT data in calibrating WRF-hydro hydrological model over the river basin**, Kaushlendra Verma, Indu J., Indian Institute of Technology Bombay (India) . . . . [12262-30]

11:40: **Simplified analysis of the influence of climate change on the melting of Chimborazo Mountain glacier using partial least squares (PLS) and remote sensing**, Cesar Ivan Alvarez Mendoza, Univ. Politécnica Salesiana (Ecuador); Lenin Ramirez, Univ. Yachay Tech (Ecuador) . . [12262-31]

SESSION 8

LOCATION: SAAL V . . . . **WED 12:00 TO 13:20**

Hydrology II

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

12:00: **Analysis of spatial and temporal consistency of soil moisture multispectral indices based on optical satellite data**, Andrea Gonnelli, Roberto Carlà, Stefano Baronti, Valentina Raimondi, Istituto di Fisica Applicata "Nello Carrara" (Italy) . . . . [12262-33]

12:20: **Application of remote sensing and GIS technique to identify resource potential zone for sustainable watershed: a case study of Takoli Gad watershed, Tehri Garhwal, Uttarakhand, India**, Nidhi Chhillar, Varun Joshi, Guru Gobind Singh Indraprastha Univ. (India). . . . . [12262-34]

12:40: **Isotopic tracing for residence time and recharge mechanisms of groundwater in mountainous carbonate aquifers: case from Rif Mountains (northern Morocco)**, Mohammed Hssaisoune, Lhoussaine Bouchaou, Univ. Ibn Zohr (Morocco); Mohamed Qurtobi, Ctr. National de l'Energie, des Sciences et des Techniques Nucléaires (Morocco) . . [12262-35]

13:00: **Remote sensing analysis of historical drought spatial-temporal differentiation law in the middle and lower reaches of the Yangtze river**, Daxiang Xiang, Ying Jiang, Zhe Chen, Xiongfei Wen, Zhe Li, Changjiang River Scientific Research Institute (China) . . . . [12262-36]

CONFERENCE 12263

Tuesday 6 September 2022 • Proceedings of SPIE Vol. 12263

Remote Sensing of the Ocean, Sea Ice, Coastal Waters, and Large Water Regions 2022

Conference Chairs: **Charles R. Bostater Jr.,** Florida Institute of Technology (United States); **Xavier Neyt,** Royal Military Academy (Belgium)

Programme Committee: **Samir Ahmed,** The City College of New York (United States); **Jean-Paul Bruyant,** ONERA (France); **Alexander Gilerson,** The City College of New York (United States); **Carlton R. Hall,** NASA Kennedy Space Ctr. (United States); **Frederic Lamy,** ONERA (France); **Ana M. Martins,** Univ. dos Açores (Portugal); **Stelios P. Mertikas,** Technical Univ. of Crete (Greece); **Petri Pellikka,** Univ. of Helsinki (Finland); **Françoise Viallefont-Robinet,** ONERA (France)

TUESDAY 6 SEPTEMBER

SESSION 1
LOCATION: ESTREL HALL C7 . . . . TUE 9:10 TO 10:10

Water Surface Effects
Session Chair: **Xavier Neyt,** Royal Military Academy (Belgium)

9:10: **High-frequency surface wave radar performance analysis for CA-CFAR algorithm in Weibull-distributed clutter**, Diego Medeiros, Romulo Costa, Dimas Irion Alves, Instituto de Aeronáutica e Espaço (Brazil); Renato J. Machado, Instituto Tecnológico de Aeronáutica (Brazil); Osamu Saotome, Instituto de Aeronáutica e Espaço (Brazil). . . . . [12263-1]

9:30: **Evaluation of wind speed estimates of observations of the west coast of India with Era-interim, IMDAA, NCEP-FNL, and Scatsat-1**, Pubali Mukherjee, Balaji Ramakrishnan, Indian Institute of Technology Bombay (India). . . . . [12263-2]

9:50: **Recent progress on sea-level rise over the marginal seas in Southeast Asia**, Nurul Hazrina Idris, Muhammad Haikal Fayyadh Munadi, Univ. Teknologi Malaysia (Malaysia) . . . . [12263-3]

Coffee Break. . . . . Tue 10:10 to 10:40

SESSION 2
LOCATION: ESTREL HALL C7 . . . . .TUE 10:40 TO 12:00

Sub-surface Water Monitoring
Session Chair: **Charles R. Bostater Jr.,**
Florida Institute of Technology (United States)

10:40: **Compact, large aperture 2D deflection optic for LiDAR underwater applications**, Jannis Gangelhoff, Christoph S. Werner, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Alexander Reiterer, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany) and INATECH (Germany) . . . . [12263-5]

11:00: **Monte Carlo modeling of shallow marine waters**, Charles R. Bostater Jr., Florida Institute of Technology (United States) . . . . [12263-6]

11:20: **Extreme gradient boosting machine learning for total suspended matter (TSM) retrieval from Sentinel-2 imagery**, Milad Niroumand-Jadidi, Francesca Bovolo, Fondazione Bruno Kessler (Italy) . . . . [12263-7]

11:40: **UAV's remote sensing for observation of micro-atolls in shallow waters of Small Islands, Spermode Archipelago, Indonesia**, Nurjannah Nurdin, Abdul Haris, Khairul Amri, Mahatma Lanuru, Agus Agus, Syazwi Qutbhi Al Azizi, Hasanuddin Univ. (Indonesia); Teruhisa Komatsu, The Univ. of Tokyo (Japan) and Yokohama College of Commerce (Japan) . . . . [12263-9]

Lunch/Exhibition Break . . . . Tue 12:20 to 13:30

SESSION 3
LOCATION: ESTREL HALL C7 . . . . .TUE 13:30 TO 15:30

Sensors for Water Monitoring
Session Chair: **Charles R. Bostater Jr.,**
Florida Institute of Technology (United States)

13:30: **Understanding the effects of sensor wiewing and illumination geometry upon satellite-derived images of coastal waters**, Charles R. Bostater Jr., Florida Institute of Technology (United States) . . . . [12263-10]

13:50: **S-NPP and NOAA-20 VIIRS TEB response versus scan-angle assessment using an in situ ocean scene**, Carlos L. Pérez Díaz, Science Systems and Applications, Inc. (United States); Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States) . . . . [12263-11]

14:10: **Multitemporal multispectral drone imagery for water hyacinth**

mapping in Patancheru lake, Hyderabad, India, Vahid Akbari, Univ. of Stirling (United Kingdom); Aviraj Datta, International Crops Research Institute for the Semi-Arid Tropics (India); Deepayan Bhowmik, Armando Marino, Univ. of Stirling (United Kingdom); Saurav Kumar, CSIR - Central Scientific Instruments Organisation (India); Srikanth Rupavatharam, International Crops Research Institute for the Semi Arid Tropics (India); G. Nagendra Prabhu, Ctr. for Research on Aquatic Resources, Sanatana Dharma College (India); Adam Kleczkowski, Univ. of Strathclyde (United Kingdom); J. Alice R. P. Sujeetha, National Institute of Plant Health Management (India); Savi Maharaj, Univ. of Stirling (United Kingdom) . . . . [12263-12]

14:30: **Assessment of monitoring and security on the Black Sea coast by Remote sensing and Open data**, Temenuzhka Spasova, Space Research and Technology Institute (Bulgaria) . . . . [12263-13]

14:50: **An optimized sea surface emissivity model**, Li Yanyan, South China Sea Information Center,SOA (China); Yubo Wen, Jielan Xie, Qiheng Liu, South China Sea Information Center, SOA (China) . . . . [12263-14]

15:10: **Spatiotemporal variability of sea surface salinity and its covariation with freshwater flux in the Indo-Pacific Warm Pool region**, Li Yanyan, South China Sea Information Center,SOA (China); Yiqiang Hu, Guangzhou Institute of Geography, Guangdong Academy of Sciences (China); Yubo Wen, Jielan Xie, Qiheng Liu, South China Sea Information Center, SOA (China). . . . . [12263-15]

POSTER SESSION
LOCATION: FOYER ESTREL SAAL ESTREL HALL. . . . . 17:30 TO 19:00

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The retrieval of subsurface current velocity from dual polarized radar data, Irina A. Sergievskaya, Leonid Plotnikov, Stanislav A. Ermakov, Olga V. Shomina, Ivan A. Kapustin, Institute of Applied Physics (Russian Federation) . . . . [12263-17]

Theoretical analisys and wave tank modeling of damping of gravity waves due to ice floes, Gregory E. Khazanov, Stanislav A. Ermakov, Vladimir A. Dobrokhotov, Daria V. Vostryakova, Institute of Applied Physics (Russian Federation) . . . . [12263-18]

Modification of the method for retreival of the atmospheric boundary layer dynamic parameters in hurricane conditions, taking into account the angular dependence of the water surface cross-pol NRCS, Olga S. Ermakova, Nikita S. Rusakov, Eugeny I. Poplavsky, Yuliya I. Troitskaya, Institute of Applied Physics (Russian Federation). . . . . [12263-19]

Investigation of the applicability of the CMOD5 algorithm for the wind speed retrieval in weak and moderate wind conditions from Sentinel SAR image data, Daniil A. Sergeev, Olga S. Ermakova, Nikita S. Rusakov, Eugeny I. Poplavsky, Institute of Applied Physics (Russian Federation). . . . . [12263-20]

CONFERENCE 12264

Tuesday–Wednesday 6–7 September 2022 • Proceedings of SPIE Vol. 12264

Sensors, Systems, and Next-Generation Satellites XXVI

Conference Chairs: **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)

Programme Committee: **Philippe Martimort,** European Space Research and Technology Ctr. (Netherlands); **Josep Rosello,** European Space Research and Technology Ctr. (Netherlands); **Xiaoxiong J. Xiong,** NASA Goddard Space Flight Ctr. (United States)

MONDAY 5 SEPTEMBER

REMOTE SENSING PLENARY

LOCATION: CONVENTION HALL I-D . . . . .16:15 TO 18:00

16:15 to 16:30: **Welcome Address and Plenary Speaker Introduction**
Karsten Schulz,Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

16:30: **The German environmental hyperspectral satellite EnMAP: mission update and related science activities** *(Plenary)*
Sabine I. Chabrillat, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ (Germany) and Leibniz Univ. Hannover (Germany)

17:15: **The space debris challenge: ESA's answer** *(Plenary)*
Holger Krag, European Space Operations Ctr. (Germany

TUESDAY 6 SEPTEMBER

SESSION 1

LOCATION: SAAL II . . . . .TUE 8:50 TO 10:20

US Missions

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

8:50: **NASA missions program overview** *(Invited Paper)*, Sachidananda R. Babu, NASA Earth Science Technology Office (United States) . . . . . . [12264-1]

9:20: **Celebrating a decade of successful joint polar satellite system (JPSS) operations and preparing for JPSS-2 launch**, Satya Kalluri, NOAA/NESDIS/JPSS (United States) . . . . [12264-2]

9:40: **MethaneAIR: a high-resolution infrared imaging spectrometer for airborne measurements of CH4 and CO2**, Jenna Samra, Harvard-Smithsonian Ctr. for Astrophysics (United States); Jonathan Franklin, Bruce Daube, Harvard Univ. (United States); Jacob Hawthorne, Peter Cheimets, Harvard-Smithsonian Ctr. for Astrophysics (United States); Scott Milligan, Headwall Photonics, Inc. (United States); Martin Ettenberg, Princeton Infrared Technologies, Inc. (United States); Joshua Benmergui, MethaneSAT, LLC (United States); Kelly Chance, Harvard-Smithsonian Ctr. for Astrophysics (United States); Apisada Chulakadabba, Harvard Univ. (United States); Eamon Conway, George J. Kostas Research Institute for Homeland Security (United States); Xiong Liu, Harvard-Smithsonian Ctr. for Astrophysics (United States); Christopher Chan Miller, Harvard Univ. (United States); Sébastien Roche, Harvard-Smithsonian Ctr. for Astrophysics (United States); Maryann Sargent, Harvard Univ. (United States); Amir Souri, Harvard-Smithsonian Ctr. for Astrophysics (United States); Kang Sun, Univ. at Buffalo (United States); Jonas Wilzewski, Steven Wofsy, Harvard Univ. (United States) . . . . [12264-3]

10:00: **Future Earth radiation budget observations utilizing Agile Sensorcraft**, Kory J. Priestley, NASA Langley Research Ctr. (United States). . . . . [12264-4]

Coffee Break. . . . . .Tue 10:20 to 10:50

SESSION 2

LOCATION: SAAL II . . . . .TUE 10:50 TO 13:00

European Missions

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

10:50: **European Space Agency future earth observation missions** *(Invited Paper)*, Arnaud Hélière, Bernardo Carnicero Dominguez, Martin Suess, Philippe Martimort, Josep Rosello, European Space Agency (Netherlands) . . . . [12264-5]

11:20: **Next generation gravity mission design activities within the mass change and geoscience international constellation**, Luca Massotti, Alexandra Bulit, Ilias Daras, Bernardo Carnicero Dominguez, Olivier Carraz, Kevin Hall, Arnaud Hélière, Gunther March, Philippe Martimort, Goncalo Rodrigues, Pierluigi Silvestrin, Neil Wallace, European Space Research and Technology Ctr. (Netherlands) . . . . [12264-6]

11:40: **IASI-NG instrument development and verification status**, Elisa Baldit, Jérémie Ansart, Antoine Penquer, François Bermudo, Ctr. National d'Études Spatiales (France); François Faure, Airbus Defense and Space (France); Lionel Carminati, Airbus Defence and Space (France); Sylvain Thomas, Vincent Crombez, Hania Arsalane, Airbus Defense and Space (France) . . . . [12264-7]

12:00: **Copernicus CO2M mission for monitoring anthropogenic carbon dioxide emissions from space: payload status**, Yannig Durand, Grégory Bazalgette Courrèges-Lacoste, Charlotte Pachot, Arnaud Pasquet, European Space Agency (Netherlands); Anantha Chanumolu, The European Space Exploration Programme Aurora - ESA (Netherlands); Yasjka Meijer, Valérie Fernandez, European Space Agency (Netherlands); Stefan Lesschaeve, OIP Sensor Systems (Belgium); David Spilling, Thales Alenia Space (United Kingdom); Antoine Dussaux, Denis Serre, Thales Alenia Space (France); Frank te Hennepe, OHB System AG (Germany) . . . . [12264-8]

12:20: **Antenna-coupled large-bandwidth VO2 vertical switches for millimeter wave and sub-terahertz detection**, Fatemeh Qaderi Rahaqi, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Yannik Horst, Tobias Blatter, Maurizio Burla, ETH Zurich (Switzerland); Daesung Park, Sadegh Kamaei Bahmaei, Ali Gilani, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Juerg Leuthold, ETH Zurich (Switzerland); Adrian M. Ionescu, Ecole Polytechnique Fédérale de Lausanne (Switzerland) . . [12264-9]

12:40: **Geometric calibration of an airborne imager by natural angular targets: rainbow, glory, and hot spot**, Souichiro Hioki, Jérôme Riedi, Mohamed S. Djellali, Univ. de Lille (France) . . . . [12264-10]

Lunch/Exhibition Break . . . . Tue 13:00 to 14:10

SESSION 3

LOCATION: SAAL II . . . . .TUE 14:10 TO 15:20

Japanese Missions I

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

14:10: **Overview of Japanese Earth Observation programs** *(Invited Paper)*, Toshiyoshi Kimura, Japan Aerospace Exploration Agency (Japan). . [12264-11]

14:40: **ALOS-4/PALSAR-3 current status**, Satoko H. Miura, |Yukihiro Kankaku, Takeshi Motohka, Yoshihisa Arikawa, Shinichi Suzuki, Japan Aerospace Exploration Agency (Japan) . . . . [12264-12]

15:00: **Extending JAXA's long-term L-band SAR forest observation legacy with ALOS-4/PALSAR-3**, Christian Koyama, Masato Ohki, Takeshi Motooka, Masato Hayashi, Takeo Tadono, Japan Aerospace Exploration Agency (Japan) . . . . [12264-13]

Coffee Break. . . . . .Tue 15:20 to 15:50

SESSION 4

Japanese Missions II

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

15:50: **ALOS-2 disaster mapping processing and its implementation in an operational system**, Masato Ohki, Yuki Takakura, Shiro Kawakita, Christian Koyama, Takeo Tadono, Japan Aerospace Exploration Agency (Japan). . . . . [12264-14]

16:10: **Development of the wide-swath and high-resolution optical imager (WISH) onboard Advanced Land Observing Satellite-3 (ALOS-3)**, Asami Hayato, Hidenori Watarai, Kei Shimomura, Tomoya Niwa, Japan Aerospace Exploration Agency (Japan); Yasutaka Fujii, Mitsubishi Electric Corp. (Japan); Toru Matsuda, Canon Inc. (Japan). . . . . [12264-15]

16:30: **Greenhouse gas observation by TANSO-3 onboard GOSAT-GW**, Tsuneo Matsunaga, Hiroshi Tanimoto, National Institute for Environmental Studies (Japan). . . . . [12264-16]

16:50: **On-orbit performance of hyperspectral imager suite (HISUI)**, Jun Tanii, Hitomi Inada, Tetsushi Tachikawa, Osamu Kashimura, Japan Space Systems (Japan); Akira Iwasaki, The Univ. of Tokyo (Japan); Yoshiyuki Ito, Ritsuko Imatani, Koji Ikehara, NEC Corp. (Japan). . . . . [12264-17]

POSTER SESSION

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MODIS TEB electronic crosstalk correction update and impact on L1B product uncertainty, Tiejun Chang, Ashish Shrestha, Carlos L. Pérez Díaz, Truman Wilson, Aisheng Wu, Science Systems and Applications, Inc. (United States); Xiaoxiong Xiong, Sciences and Exploration Directorate, NASA Goddard Space Flight Ctr. (United States) . . . . [12264-31]

Step-by-step alignment methodology for high resolution payloads using theodolite, Javad Haghshenas, Reza Sharifi Hafshejani, Satellite Systems Research Institute (Iran, Islamic Republic of) . . . . [12264-32]

VIIRS TEB calibration uncertainty analysis, Carlos L. Pérez Díaz, Kwofu Chiang, Junqiang Sun, Science Systems and Applications, Inc. (United States); Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States). . . . [12264-34]

Constraining the parameter space for robust in-orbit refocusing of TDI-based imaging systems, Nicola Baccichet, Florian Richter, OHB Systems AG (Germany); Paolo Sandri, OHB System AG (Germany). . . . . [12264-36]

Temporal stability evaluation of the reflective bands of the LTDR AVH09C1 product for the NOAA-19 satellite, Jose A. Moreno-Ruiz, Jose R. Garcia-Lazaro, Univ. de Almería (Spain); Manuel Arbelo, Enrique Casas-Mas, Univ. de La Laguna (Spain) . . . . [12264-37]

Innovative volume-sharing multi-aperture payload for high resolution small satellites, Jun Ho Lee, Seok Gi Han, Kongju National Univ (Korea, Republic of); Do Hee Kim, Kongju National Univ (Kiribati, Republic of); Myoungjoo Kang, Seoul National Univ. (Korea, Republic of); Sehyun Seong, shseong@telepix.net (Korea, Republic of) . . . . [12264-38]

Determination of alkali metal trace elements concentrations in dry biomass vegetation species for optical imaging validation within the near-infrared band, Zimbini Faniso, Edwin Magidimisha, CSIR (South Africa) . . . . [12264-39]

Calibration of the multispectral MWIR payload of the ERNST microsatellite, Thorsten Maue, Fraunhofer Institute for High-Speed Dynamics (Germany); Uwe Adomeit, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation (Germany); Clemens Horch, Konstantin Schäfer, Martin Schimmerohn, Frank Schäfer, Fraunhofer Institute for High-Speed Dynamics (Germany) . . . . [12264-40]

Determination of the major and trace elements concentrations in local dry vegetation biomass species by inductively coupled plasma optical emission spectroscopy (ICPAES), Edwin Magidimisha, Zimbini Faniso, CSIR (South Africa) . . . . [12264-41]

WEDNESDAY 7 SEPTEMBER

SECURITY + DEFENCE PLENARY

9:00 to **Welcome Address and Plenary Speaker Introduction**
9:10: **Karin Stein,** Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

9:10: **Directed energy, the answer for the new threats** *(Plenary)*
Markus Jung, Rheinmetall Waffe Munition GmbH (Germany)

9:55: **SWIR and MWIR laser sources for optronics and directed energy** *(Plenary)*
Marc Eichhorn, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) and Karlsruhe Institute of Technology (Germany)

Coffee Break. . . . . Wed 10:40 to 11:00

SESSION 5

Small Satellites

Session Chair: **Massimiliano Pastena,**
European Space Research and Technology Ctr. (Netherlands)

11:00: **New systems for high-resolution atmospheric sensing from space: TROPICS and CREWSR**, William J. Blackwell, William Moulder, MIT Lincoln Lab. (United States) . . . . [12264-19]

11:20: **CarbonCGI road map to observe faint GHG source's emissions with high resolution observing system**, Denis Siméoni, Thales Alenia Space (France); Francesco Graziosi, Grégoire Broquet, Pramod Kumar, Philippe Ciais, Lab. des Sciences du Climat et de l'Environnement (France); Jean Luc Vergely, Stéphane Ferron, ACRI-ST (France); Vitalii Khodnevych, Mikael Carlavan, IRT Saint Exupéry (France); Bruno Chétrite, Nicolas Tetaz, Christian Delzenne, Nicolas Guercio, Thales Alenia Space (France); Hartmut Boesch, Univ. of Leicester (United Kingdom); Leif Vogel, WoePal GmbH (Germany); Flavio Mariani, Roman Windpassinger, Bernd Sierk, European Space Agency (Netherlands). . . . . [12264-20]

11:40: **Compact fire infrared radiance spectral tracker (c-FIRST)**, Sarath D. Gunapala, David Z. Ting, William R. Johnson, Alexander Soibel, Olga Kalashnikova, Michael J. Garay, Ashley G. Davies, Mehmet Ogut, Jet Propulsion Lab. (United States); Ashok Sood, Magnolia Optical Technologies, Inc. (United States); John Zeller, Magnolia Optical Technologies (United States); Christopher David, Copious Imaging LLC (United States) . . [12264-21]

12:00: **Observational decision making based on forecast models and expected observational quality**, Vinay Ravindra, Sreeja Nag, BAER Institute (United States) and NASA Ames Research Ctr. (United States); Ruzbeh Akbar, Massachusetts Institute of Technology (United States); Mahta Moghaddam, Archana Kannan, Amer Melebari, The Univ. of Southern California (United States); Richard Levinson, KBR, Inc. (United States) and NASA Ames Research Ctr. (United States); Daniel Selva, Texas A&M Univ. (United States). . . . . [12264-22]

Lunch/Exhibition Break . . . . Wed 12:20 to 13:30

SESSION 6

On-ground and In-orbit Calibration

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

13:30: **Twenty years of Aqua MODIS on-orbit calibration, performance, and improvements** *(Invited Paper)*, Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States); Amit Angal, Tiejun Chang, Emily Aldoretta, Xu Geng, Daniel Link, Junqiang Sun, Kevin Twedt, Aisheng Wu, Science Systems and Applications, Inc. (United States). . . . . [12264-23]

14:00: **Cross-calibration of Landsat 8 and 9 using measurements from an ultra-portable field transfer radiometer**, Brian N. Wenny, Science Systems and Applications, Inc. (United States); Kurtis Thome, NASA Goddard Space Flight Ctr. (United States); Jeffrey S. Czapla-Myers, Nikolaus J. Anderson, Wyant College of Optical Sciences, Univ. of Arizona (United States) [12264-24]

14:20: **SNPP and N20 VIIRS thermal emissive bands calibration comparison using the GEO-LEO double difference method**, Tiejun Chang, Science Systems and Applications, Inc. (United States); Xiaoxiong Xiong, Sciences and Exploration Directorate, NASA Goddard Space Flight Ctr. (United States) . . . . [12264-25]

14:40: **Radiometric validation algorithms for DMSAT-1**, Haritha Harikrishnan, Univ of Dubai (United Arab Emirates). . . . . [12264-26]

Coffee Break. . . . . Wed 15:00 to 15:30

Hyperspectral and Focal Plane Calibration
Session Chairs: **Sachidananda R. Babu,**
NASA Earth Science Technology Office (United States);
Arnaud Hélière, European Space Agency (Netherlands)

15:30: **CHIARA: a ultra-high dynamic range hyperspectral image sensor for remote sensing**, Gaozhan Cai, Arne Crouwels, Andrew Keefe, Gerlinde Ruttens, Jente Basteleus, Jens De Vroe, Bart Dierickx, Caeleste CVBA (Belgium); Jun Wei, The Shanghai Institute of Technical Physics (China); Yi An, LUSTER LightTech Group Co., Ltd. (China); Jan P. Vermeiren, Caeleste CVBA (Belgium) . . . . [12264-28]

15:50: **Modeling a point-spread function originating from multiple reflection of light in the substrate of array sensor: the case of Akatsuki/IR2**, Takehiko Satoh, Japan Aerospace Exploration Agency (Japan); Kazunori Uemizu, National Astronomical Observatory of Japan (Japan); Munetaka Ueno, Japan Aerospace Exploration Agency (Japan); Masafumi Kimata, Consultant (Japan); Takao M. Sato, Hokkaido Information University (Japan). . . . . [12264-18]

16:10: **A miniature star sensor for cubesats**, Amir Hosein Bahrami, Khaje Nasir Univ. (Iran, Islamic Republic of); Javad Haghshenas, Satellite Systems Research Institute (Iran, Islamic Republic of) . . . . [12264-30]

CONFERENCE 12265

Monday 5 September 2022 • Proceedings of SPIE Vol. 12265

Remote Sensing of Clouds and the Atmosphere XXVII

Conference Chairs: **Adolfo Comerón,** Univ. Politècnica de Catalunya (Spain); **Evgueni I. Kassianov,** Pacific Northwest National Lab. (United States); **Klaus Schäfer,** Atmospheric Physics Consulting (Germany)

Conference Co-Chairs: **Richard H. Picard,** ARCON Corp. (United States); **Konradin Weber,** Fachhochschule Düsseldorf (Germany); **Upendra N. Singh,** NASA Langley Research Ctr. (United States)

Programme Committee: **Lucas Alados-Arboledas,** Univ. de Granada (Spain); **Aldo Amodeo,** Istituto di Metodologie per l'Analisi Ambientale (Italy); **Young Joon Kim,** Gwangju Institute of Science and Technology (Korea, Republic of)

MONDAY 5 SEPTEMBER

SESSION 1

LOCATION: ESTREL HALL C7 . . . . MON 9:20 TO 10:00

Radiative Transfer

Session Chair: **Adolfo Comerón,**
Univ. Politècnica de Catalunya (Spain)

9:20: **Development of the principal component-based accurate fast vector radiative transfer model with fine resolution in the UV to NIR wavelength range**, Qiguang Yang, NASA Langley Research Ctr. (United States) and Science Systems and Applications, Inc. (United States); Xu Liu, NASA Langley Research Ctr. (United States); Ming Zhao, NASA Langley Research Ctr. (United States) and Science Systems and Applications, Inc. (United States); Xiaozhen Xiong, Wan Wu, NASA Langley Research Ctr. (United States) . . . . [12265-1]

9:40: **Two decades of ground-based multisensor AOD measurements at US continental site: wavelength extension**, Evgueni I. Kassianov, Gabriel Gibler, Jennifer Comstock, Pacific Northwest National Lab. (United States); Connor Flynn, The Univ. of Oklahoma (United States); Jaime Barnard, Univ. of Nevada, Reno (United States) . . . . [12265-2]

Coffee Break. . . . . Mon 10:00 to 10:30

SESSION 2

LOCATION: ESTREL HALL C7 . . . . MON 10:30 TO 12:30

Remote Sensing of Clouds, Aerosols, Trace Gases and Meteorological Parameters

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

10:30: **Weather and climate products from hyperspectral satellite remote sensors**, Xu Liu, Wan Wu, NASA Langley Research Ctr. (United States); Qiguang Yang, Science Systems and Applications, Inc. (United States); Xiaozhen Xiong, Daniel K. Zhou, Allen Larar, NASA Langley Research Ctr. (United States) . . . . [12265-4]

10:50: **Exploiting the IASI profiling capability for surface parameters, atmospheric temperature, and water vapour to design emissivity contrast and water deficit indexes to monitor drought and heatwaves**, Carmine Serio, Guido Masiello, Pamela Pasquariello, Univ degli Studi della Basilicata (Italy); Italia De Feis, IAC-CNR (Italy); Pietro Mastro, Francesco Falabella, Angela Cersosimo, Sara Venafra, Univ degli Studi della Basilicata (Italy); Antonio Pepe, IREA-CNR (Italy) . . . . [12265-5]

11:10: **A comprehensive study of the biomass burning aerosol over Warsaw (2013-2020)**, Lucja Janicka, Iwona S. Stachlewska, Univ. of Warsaw (Poland); Christine Boeckmann, Univ. Potsdam (Germany); Wojciech Kumala, Univ. of Warsaw (Poland); Holger Baars, Ronny Engelmann, Leibniz-Institut für Troposphärenforschung (Germany). . . . . [12265-6]

11:30: **Spatiotemporal variations of PM2.5 concentrations across Thailand based on long-term remotely sensed observations**, Pakorn Petchprayoon, Kanjana Koedkurang, Budsaba Uamkasem, Patiwet Chalermpong, Karn Kamonborisut, Geo-Informatics and Space Technology Development Agency (Thailand) . . . . [12265-7]

11:50: **Characteristics of southwest and northeast monsoon over a few locations in India**, Rajasri Sen Jaiswal, Siva M., Rasheed M., Sona College of Technology (India); Punitha M., Sri Sarada College for Women (India) [12265-8]

12:10: **Satellite-derived spatio-temporal variations of nitrogen dioxide and sulphur dioxide over northeast India**, Upasha Tyagi, Krishan Kumar, Jawaharlal Nehru Univ. (India) . . . . [12265-9]

Lunch Break . . . . Mon 12:30 to 13:50

SESSION 3

LOCATION: ESTREL HALL C7 . . . . MON 13:50 TO 15:30

Technologies, Techniques and Algorithms for Active and Passive Remote Sensing

Session Chair: **Adolfo Comerón,**
Univ. Politècnica de Catalunya (Spain)

13:50: **Methane profile retrieval from IASI: a deep learning inversion approach based on feed-forward neural networks**, Guido Masiello, Pietro Mastro, Carmine Serio, Francesco Falabella, Pamela Pasquariello, Univ degli Studi della Basilicata (Italy) . . . . [12265-10]

14:10: **Comparison of unfiltered shortwave radiances measured by CERES from the Aqua and S-NPP or NOAA20 satellites over closely matched ocean or snow sites**, Z. Peter Szewczyk, Susan Thomas, Science Systems and Applications, Inc. (United States); Kory J. Priestley, NASA Langley Research Ctr. (United States) . . . . [12265-12]

14:30: **Use of pure rotational Raman channels for lidar measurement of aerosol extinction coefficient: the EARLINET/ACTRIS Barcelona station experience**, Alejandro Rodríguez-Gómez, Constantino Muñoz-Porcar, Univ. Politècnica de Catalunya (Spain); José-Alex Zenteno-Hernández, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Adolfo Comerón, Federico Dios, Univ. Politècnica de Catalunya (Spain); Michaël Sicard, Univ. Politècnica de Catalunya (Spain) and Institut d'Estudis Espacials de Catalunya (Spain); Cristina Gil-Díaz, Daniel Camilo F. S. Oliveira, Univ. Politècnica de Catalunya (Spain); Charly Mandal, Univ. Politècnica de Catalunya (Spain) and ONERA (France) . . . . [12265-13]

14:50: **Versatile laser transmitter for an airborne CO2 and water vapor DIAL based on a parametric laser setup**, Michael Strotkamp, Fraunhofer-Institut für Lasertechnik ILT (Germany); Jonas Hamperl, ONERA (France) and Univ. Paris-Saclay (France); Jan Fabian Geus, Fraunhofer-Institut für Lasertechnik ILT (Germany); Kjell M. Mølster, Andrius Zukauskas, KTH Royal Institute of Technology (Sweden); Jean-Baptiste Dherbecourt, ONERA (France) and Univ. Paris-Saclay (France); Valdas Pasiskevicius, KTH Royal Institute of Technology (Sweden); Lukas Nagy, Oliver Pitz, David Fehrenbacher, Hanjo Schaefer, Dirk Heinecke, SpaceTech GmbH (Germany); Stephan Rapp, Lennart Domdei, Norbert Graf, Paul Denk, InnoLas Laser GmbH (Germany); Marine Dalin, Vincent Lebat, Rosa Santagata, Jean-Michel Melkonian, Antoine Godard, Myriam Raybaut, ONERA (France) and Univ. Paris-Saclay (France); Cyrille Flamant, Lab. Atmosphères, Milieux, Observations Spatiales/Institut Pierre Simon Laplace, CNRS (France) and Sorbonne Univ., Univ. Paris-Saclay (France). . . . . [12265-15]

15:10: **Field-deployable prototype of the 1.53-μm coherent DIAL for simultaneous vertical profiling of water vapor density and wind speed and direction**, Hidenobu Tsuji, Kazuki Shigyo, Masaharu Imaki, Takayuki Yanagisawa, Shumpei Kameyama, Mitsubishi Electric Corp. (Japan) [12265-16]

Coffee Break. . . . . Mon 15:30 to 16:15

SPIE REMOTE SENSING TECHNICAL CONFERENCE 12265

REMOTE SENSING PLENARY

LOCATION: CONVENTION HALL I-D . . . . **16:15 TO 18:00**

16:15 to **Welcome Address and Plenary Speaker Introduction**
16:30: **Karsten Schulz,** Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

16:30: **The German environmental hyperspectral satellite EnMAP: mission update and related science activities**
(Plenary)
Sabine I. Chabrillat, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ (Germany) and Leibniz Univ. Hannover (Germany)

17:15: **The space debris challenge: ESA's answer** *(Plenary)*
Holger Krag, European Space Operations Ctr. (Germany

TUESDAY 6 SEPTEMBER

POSTER SESSION
LOCATION: FOYER ESTREL SAAL ESTREL HALL . . . . **17:30 TO 19:00**

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 AM–17:00 hrs

View poster presentation guidelines and set-up instructions at https://spie.org/conferences-and-exhibitions/sensors-and-imaging/ presenters/prepare-to-present/poster-presentation-guidelines

Performance of a cloud-aerosol lidar system at 532 and 1064 nm: application to studies of cloud structures and aerosol profiles from the ground, Khaled Gasmi, King Fahd Univ. of Petroleum & Minerals (Saudi Arabia). . . . . [12265-17]

Spectral analysis using a near-infrared region (NIR) sensitive camera towards the identification of chemical pollutants, Natacha B Silva, Mário Luís Pinho, Manuel Azenha, Cosme Moura, Carlos Pereira, Departamento de Química e Bioquímica - Faculdade de Ciências da Universidade do Porto (Portugal); Pedro Cruz, Daniel Ranzal, Andrea Cannizzaro, Bosch Security Systems, S.A. (Portugal) . . . . [12265-18]

A study on the impact of mountainous terrain on transboundary and local pollution, Makiko Nakata, Itaru Sano, Kindai Univ. (Japan); Sonoyo Mukai, The Kyoto College of Graduate Studies for Informatics (Japan); Souichiro Hioki, Univ. Lille (France) . . . . [12265-19]

Availability of polarization information for the hazy aerosol analysis, Sonoyo Mukai, The Kyoto College of Graduate Studies for Informatics (Japan); Itaru Sano, Makiko Nakata, Kindai Univ. (Japan); Souichiro Hioki, Univ. de Lille (France) . . . . [12265-20]

Particle fluxes over rural environment in Poland with synergetic use of Doppler and Raman lidar, Pablo Ortiz-Amezcua, Univ. of Warsaw (Poland); Patryk Poczta, Poznan Univ. of Life Sciences (Poland); Dongxiang Wang, Univ. of Warsaw (Poland); Bogdan Chojnicki, Poznan Univ. of Life Sciences (Poland); Lucas Alados-Arboledas, Univ. de Granada (Spain); Dirk Schuettemeyer, European Space Research and Technology Ctr., European Space Agency (Netherlands); Iwona S. Stachlewska, Univ. of Warsaw (Poland). . . . [12265-21]

Aerosol measurements in the tropo- and stratosphere by spectral splitting of Rayleigh and Mie signals within a compact lidar of 1 m³, Jan Froh, Josef Höffner, Alsu Mauer, Thorben H. Mense, Ronald Eixmann, Franz-Josef Lübken, Leibniz-Institut für Atmosphärenphysik e.V. (Germany); Alexander Munk, Michael Strotkamp, Bernd Jungbluth, Fraunhofer-Institut für Lasertechnik ILT (Germany) . . . . [12265-22]

Light scattering database for interpretation of lidar sounding of cirrus clouds, Alexander V. Konoshonkin, Natalia V. Kustova, Victor A. Shishko, Dmitriy N. Timofeev, Ilya V. Tkachev, V.E. Zuev Institute of Atmospheric Optics (Russian Federation). . . . . [12265-23]

Calculation of light backscattering matrix by the DDA method for arbitrary particles of cirrus clouds for lidar remote sensing, Alexander V. Konoshonkin, Viktor A. Shishko, Natalia V. Kustova, Dmitriy N. Timofeev, Ilya V. Tkachev, Nadezhda Kan, Kirill S Salnikov, V.E. Zuev Institute of Atmospheric Optics (Russian Federation) . . . . [12265-24]

Peculiarities of polarization at vicinity of near backscattering direction by atmospheric irregular crystal particles, Natalia V. Kustova, V.E. Zuev Institute of Atmospheric Optics (Russian Federation); Alexander V. Konoshonkin, V.E. Zuev Institute of Atmospheric Optics (Russian Federation) and National Research Tomsk State Univ. (Russian Federation); Victor A. Shishko, Dmitry N. Timofeev, V.E. Zuev Institute of Atmospheric Optics (Russian Federation); Yevgen Grynko, Univ. Paderborn (Germany). . [12265-25]

Light backscattering properties of atmospheric ice hexagonal particles with a distorted geometry within the physical optics approximation, Dmitriy N. Timofeev, Natalia V. Kustova, Viktor A. Shishko, Alexander V. Konoshonkin, V.E. Zuev Institute of Atmospheric Optics (Russian Federation) . . . . [12265-26]

Giant methane, NO2 and CO emissions from coal mines in Russia detected with the Sentinel-5P's TROPOMI sensor, Plamen Trenchev, Maria Dimitrova, Space Research and Technology Institute (Bulgaria). . . . . [12265-27]

On the synergic use of satellite microwave and infrared measurements for the estimation of effective radius of ice and liquid water clouds: a regression approach based on random forests, Pietro Mastro, Univ. degli Studi della Basilicata (Italy); Domenico Cimini, Filomena Romano, Elisabetta Ricciardelli, Francesco Di Paola, Guido Masiello, Carmine Serio, National Research Council of Italy, Institute of Methodologies for Environmental Analysis (CNR-IMAA) (Italy) . . . . [12265-29]

CONFERENCE 12266

Tuesday 6 September 2022 • Proceedings of SPIE Vol. 12266

Environmental Effects on Light Propagation and Adaptive Systems V

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

Programme Committee: **Sukanta Basu,** Technische Univ. Delft (Netherlands); **Ivo Buske,** Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Christian Eisele,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Michael Hart,** Univ. of Arizona (United States); **Andrey V. Kanaev,** Office of Naval Research Global (United States); **Luc Labarre,** ONERA (France); **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); **Italo Toselli,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Alexander M. J. van Eijk,** TNO Defence, Security and Safety (Netherlands); **Arthur D. van Rheenen,** Norwegian Defence Research Establishment (Norway); **Marie-Thérèse Velluet,** ONERA (France); **Vladimir Yurievich Venediktov,** Saint Petersburg Electrotechnical Univ. "LETI" (Russian Federation), St.-Petersburg State Univ. {Russian Federation); **Oskar F. von der Lühe,** Kiepenheuer-Institut für Sonnenphysik (Germany); **Henry White,** BAE Systems (United Kingdom)

TUESDAY 6 SEPTEMBER

SESSION 1
LOCATION: ESTREL HALL A . . . . TUE 9:00 TO 10:30

Experimental Characterization of the Atmosphere
Session Chair: **Karin Stein,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

9:00: **Turbulence distribution characterization with a high-resolution Shadow Band Ranger for free space optical communications applications** *(Invited Paper)*, Frédéric Jabet, Maxime Lamotte, Miratlas (France) . . . . [12266-1]

9:30: **Laser propagation measurements over a multi-km path in a maritime environment**, Sven A. van Binsbergen V, TNO (Netherlands); Erik Sucher, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Loes C. W. Scheers, Alexander M. J. van Eijk, TNO (Netherlands); Karin Stein, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12266-2]

9:50: **Investigating the integrated optical turbulence over the sea using different measurement techniques and mesoscale model simulation runs**, Erik Sucher, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Sven A. van Binsbergen, TNO (Netherlands); Carmen Ullwer, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Alexander M. J. van Eijk, TNO (Netherlands) and Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Karin Stein, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Detlev Sprung, Fraunhofer IOSB (Germany) . [12266-3]

10:10: **Characteristics of optical turbulence over the sea**, Erik Sucher, Fraunhofer IOSB (Germany); Sven Binsbergen, TNO (Netherlands); Carmen Ullwer, Detlev Sprung, Fraunhofer IOSB (Germany); Alexander M.J. van Eijk, TNO (Netherlands) and Fraunhofer IOSB (Germany); Karin Stein, Fraunhofer IOSB (Germany). . . . . [12266-4]

Coffee Break. . . . . Tue 10:30 to 11:00

SESSION 2
LOCATION: ESTREL HALL A . . . . TUE 11:00 TO 12:30

New Devices for Atmospheric Measurements
Session Chair: **Julia Hofmann,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

11:00: **Anisotropic turbulence identification from classifying extreme morphological changes in targets with deep learning** *(Invited Paper)*, Darío G. Pérez, Alina Madrid, Hishan Farfán, Bastián Romero, Pontificia Univ. Católica de Valparaíso (Chile) . . . . [12266-5]

11:30: **High-speed complex phase retrieval of a Gaussian beam propagating through controlled optical turbulence**, Eduardo Peters, Univ. de los Andes (Chile); Marco Sepúlveda, Leandro Nuñez, Pontificia Univ. Católica de Valparaíso (Chile); Gustavo Funes, Univ. de los Andes (Chile); Darío G. Pérez, Pontificia Univ. Católica de Valparaíso (Chile). . . . . . . [12266-6]

11:50: **Thermal optimization of a laser scanner**, Philipp von Olshausen, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Philip Hanisch, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany) and Hochschule Konstanz (Germany); Jannis Gangelhoff, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Ludwig Eicher, Hochschule Konstanz (Germany); Alexander Reiterer, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany) and Univ. of Frieburg (Germany). . . . . . [12266-7]

12:10: **Structured light production with the use of polarization interferometer**, Boris A Evtushenko, Saint Petersburg Electrotechnical Univ. (Russian Federation); Kseniya N. Gavril'eva, Yurii S Gudin, Saint Petersburg Electrotechnical Univ. "LETI" (Russian Federation); Vladimir Nenadovich, Research and Production Corp. "Precision Systems and Instruments", JSC (Russian Federation); Anastsiya A. Ryzhaya, Alexander A. Sevryugin, Egor V. Shalymov, Saint Petersburg Electrotechnical Univ. "LETI" (Russian Federation); Andrey L. Sokolov, Research and Production Corp. "Precision Systems and Instruments", JSC (Russian Federation); Vladimir Y. Venediktov, Saint Petersburg Electrotechnical Univ. "LETI" (Russian Federation) . [12266-8]

Lunch/Exhibition Break . . . . Tue 12:30 to 13:40

SESSION 3
LOCATION: ESTREL HALL A . . . . TUE 13:40 TO 15:40

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

13:40: **Effectiveness of adaptive optics for coherent laser communications in atmospheric turbulence**, Italo Toselli, Szymon Gladysz, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12266-9]

14:00: **Investigation of advanced control for adaptive optics in free space optical communication**, Helawae Friew Kelemu, Andrew Reeves, Ramon Mata Calvo, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Wolfgang Drewelow, Torsten Jeinsch, Univ. Rostock (Germany). . . . [12266-10]

14:20: **Fast steering prism for correction of tip tilt aberrations**, Antonio Vanzo, Kevin Campaci, Tommaso Furieri, CNR-Istituto di Fotonica e Nanotecnologie (Italy); Jacopo Mocci, Francesco Mazzocco, Dynamic Optics S.r.l. (Italy); Stefano Bonora, CNR-Istituto di Fotonica e Nanotecnologie (Italy) . . . . [12266-11]

14:40: **Multi-conjugate adaptive optics with deformable lenses**, Tommaso Furieri, Kevin Campaci, Univ. degli Studi di Padova (Italy); Stefano Bonora, CNR-Istituto di Fotonica e Nanotecnologie (Italy). . [12266-15]

15:00: **Development of a cascaded fine pointing and tracking control loop for quantum key distribution via free-space optical communications**, René Rüddenklau, Eltimir Peev, Florian Moll, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . [12266-12]

15:20: **Analysis of power scintillation in the LEO-ground link with the OSIRISv1 laser terminal on Flying Laptop and the DLR Optical Ground Station Oberpfaffenhofen**, Florian Moll, Christopher Schmidt, Dirk Giggenbach, Christian Fuchs, German Aerospace Center (DLR) (Germany) . . . . [12266-17]

Coffee Break. . . . . Tue 15:40 to 16:10

SESSION 4

SPIE REMOTE SENSING TECHNICAL CONFERENCE 12266

Imaging through the Atmosphere
Session Chair: **Alexander M. J. van Eijk,** TNO (Netherlands)

16:10: **An appraisal of suitable evaluation methods for turbulence mitigation algorithms**, Claudia S. Hübner, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12266-13]

16:30: **The EDA TURBO project: software-based atmospheric turbulence mitigation**, Julia Hofmann, Rilene Goelzer, Szymon Gladysz, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12266-14]

16:50: **Improving the quality and visibility of objects in images captured in difficult weather conditions**, Evgeny A. Semenishchev, Voronin Vizcheslav, Moscow State Univ. of Technology "STANKIN" (Russian Federation) . . . . [12266-16]

CONFERENCE 12267

Monday–Tuesday 5–6 September 2022 • Proceedings of SPIE Vol. 12267

Image and Signal Processing for Remote Sensing XXVIII

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

Conference Co-Chairs: **Jon Atli Benediktsson,** Univ. of Iceland (Iceland); **Fabio Bovenga,** CNR IREA (Italy); **Claudia Notarnicola,** EURAC Research (Italy); **Nazzareno Pierdicca,** Univ. degli Studi di Roma La Sapienza (Italy); **Emanuele Santi,** Istituto di Fisica Applicata Nello Carrara (Italy)

Programme Committee: **Selim Aksoy,** Bilkent Univ. (Turkey); **Luciano Alparone,** Univ. degli Studi di Firenze (Italy); **Gustavo Camps-Valls,** Univ. de València (Spain); **Jocelyn Chanussot,** Lab. des Images et des Signaux (France); **Chi-Hau Chen,** Univ. of Massachusetts Dartmouth (United States); **B. S. Daya Sagar,** Indian Statistical Institute, Bangalore (India); **Fabio Dell'Acqua,** Univ. degli Studi di Pavia (Italy); **Begüm Demir,** Technische Univ. Berlin (Germany); **Peijun Du,** Nanjing Univ. (China); **Andrea Garzelli,** Univ. degli Studi di Siena (Italy); **Jordi Inglada,** Ctr. d'Etudes Spatiales de la Biosphère (France); **Jun Li,** Sun Yat-Sen Univ. (China); **Sicong Liu,** Tongji Univ. (China); **Claudia Paris,** Univ. degli Studi di Trento (Italy); **David Small,** Univ. Zürich (Switzerland); **Florence Tupin,** Télécom ParisTech (France); **Benoit Vozel,** Univ. de Rennes 1 (France); **Josiane B. Zerubia,** INRIA Sophia Antipolis - Méditerranée (France)

MONDAY 5 SEPTEMBER

WELCOME AND OPENING REMARKS
LOCATION: SAAL III . . . . 9:00 TO 9:10

Lorenzo Bruzzone, Univ. degli Studi di Trento (Italy);
Francesca Bovolo, Fondazione Bruno Kessler (Italy)
Conference Chairs

SESSION 1
LOCATION: SAAL III . . . . MON 9:10 TO 10:20

Calibration, Image Enhancement and Restoration
Session Chair: **Lorenzo Bruzzone,** Univ. degli Studi di Trento (Italy)

9:10: **Fast on-board ship detection in panchromatic images based on micro- nano satellite**, Jing Qi, DFH Satellite Co., Ltd. (China); Chen Guo, Haopeng Zhang, Beihang Univ. (China) . . . . [12267-1]

9:20: **Star centroid extraction in the image sequence of a discrete detector array on geostationary orbit**, Sijia Qiao, Zhexin Han, Haopeng Zhang, Beihang Univ. (China). . . . . [12267-2]

9:30: **Two-step registration of near-space remote sensing images via deep neural networks**, Xiaohan Li, Beihang Univ. (China); Meng An, Institute of Spacecraft System Engineering, CAST (China); Haopeng Zhang, Fengying Xie, Beihang Univ. (China) . . . . [12267-3]

9:40: **Assessment of preprocessing techniques in a model-based automatic target recognition algorithm for the SAMPLE dataset**, Gustavo F. Araujo, Renato Machado, Instituto Tecnológico de Aeronáutica (Brazil); Mats I. Pettersson, Blekinge Institute of Technology (Sweden) . . . . . . [12267-4]

10:00: **Point cloud restoration via 2D projection and inpainting**, Adrian Mai, Mark Bilinski, Raymond Provost, Michael Hess, Naval Information Warfare Ctr. Pacific (United States) . . . . [12267-44]

Coffee Break. . . . . Mon 10:20 to 10:40

SESSION 2
LOCATION: SAAL III . . . . MON 10:40 TO 12:20

Object Detection and Classification
Session Chair: **Lorenzo Bruzzone,** Univ. degli Studi di Trento (Italy)

10:40: **Point process and CNN for small object detection in satellite images**, Jules Mabon, Institut National de Recherche en Informatique et en Automatique, Univ. Côte d'Azur (France); Mathias Ortner, Airbus Defence and Space (France); Josiane Zerubia, Institut National de Recherche en Informatique et en Automatique, Univ. Côte d'Azur (France) . . . . [12267-5]

11:00 TBA2 . . . . [12267-52]

11:20: **An automatic ice block falls detection approach in Martian north polar region**, Zhengxiang Song, Sicong Liu, Yanmin Jin, Tongji Univ. (China) . . . . [12267-7]

11:40: **Compressed domain classification of remote sensing scene images based on bub-band data fusion**, Berk Arican , Erdem Safa Akkul, Istanbul Technical Univ. (Turkey); Levent Çarkacioglu, ASELSAN A.S. (Turkey); Behçet U. Töreyin, Istanbul Technical Univ. (Turkey) . . . . [12267-8]

12:00: **Accelerating a two-stage object detector for high quality in-orbit remote sensing**, Jaemin Kang, Jinse Kwon, Hyungshin Kim, Chungnam National Univ. (Korea, Republic of) . . . . [12267-9]

Lunch Break . . . . Mon 12:20 to 14:10

SESSION 3
LOCATION: SAAL III . . . . MON 14:10 TO 15:10

Change Detection and Damage Assessment
Session Chair: **Francesca Bovolo,** Fondazione Bruno Kessler (Italy)

14:10: **Monitoring of coastal landslides using Sentinel-1 imagery**, Mila S. Atanasova-Zlatareva, National Institute in Geophysics, Geodesy, and Geography (Bulgaria); Hristo S. Nikolov, Space Research and Technology Institute (Bulgaria); Anton Ivanov, National Institute in Geophysics, Geodesy, and Geography (Bulgaria) . . . . [12267-49]

14:20: **Fire image detection based on clustering data mining techniques**, Houda Harkat, Jose Nascimento, Instituto de Telecomunicações (Portugal); Alexandre Bernardino, Institute de Sistemas e Robotica (Portugal); Hasmath Farhana Thariq Ahmed, Department of Computer Science Engineering, Vellore Institute of Technology (India) . . . . [12267-12]

14:40: **Fusion of optical and SAR satellite data for environmental monitoring: assessment of damages and disturbances originated by forest fires**, Luciano Alparone, 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); Claudia Zoppetti, Univ. degli Studi di Siena (Italy) . . . . [12267-13]

15:00: **Unsupervised change detection in multimodal SAR images using CycleGAN feature maps**, Luca Bergamasco, Francesca Bovolo, Fondazione Bruno Kessler (Italy) . . . . [12267-14]

Coffee Break. . . . . Mon 15:10 to 16:15

REMOTE SENSING PLENARY
LOCATION: CONVENTION HALL I-D . . . . .16:15 TO 18:00

16:15 to **Welcome Address and Plenary Speaker Introduction**
16:30: **Karsten Schulz,**Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

16:30: **The German environmental hyperspectral satellite EnMAP: mission update and related science activities**
(Plenary)
Sabine I. Chabrillat, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ (Germany) and Leibniz Univ. Hannover (Germany)

17:15: **The space debris challenge: ESA's answer** *(Plenary)*
Holger Krag, European Space Operations Ctr. (Germany

SPIE REMOTE SENSING TECHNICAL CONFERENCE 12267

TUESDAY 6 SEPTEMBER

SESSION 4
LOCATION: SAAL III . . . . .TUE 8:50 TO 10:10

Analysis of Hyperspectral and Multispectral Images
Session Chair: **José M. P. Nascimento,**
Instituto de Telecomunicações (Portugal)

8:50: **Multitemporal change detection based on China's domestic hyperspectral remote sensing satellite images**, Xuanning Lu, Sicong Liu, Kecheng Du, Tongji Univ. (China). . . . . [12267-15]

9:10: **Investigating the influence of hyperspectral data compression on spectral unmixing**, Jannick Kuester, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Johannes Anastasiadis, Karlsruher Institut für Technologie (Germany); Wolfgang Middelmann, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Michael Heizmann, Karlsruher Institut für Technologie (Germany) . . . . [12267-16]

9:30: **Deep self-supervised band-level learning for hyperspectral classification**, Jonathan Gonzalez-Santiago, Fabian Schenkel, Wolfgang Middelmann, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany). . . . . [12267-17]

9:50: **Remote sensing image classification using transfer learning- and attention-based deep neural network**, Lam Pham, AIT Austrian Institute of Technology GmbH (Austria); Khoa Tran, The Univ. of Danang (Vietnam); Dat Ngo, Univ. of Essex (United Kingdom); Jasmin Lampert, Alexander Schindler, AIT Austrian Institute of Technology GmbH (Austria) . . . . [12267-19]

Coffee Break. . . . . Tue 10:10 to 10:40

SESSION 5
LOCATION: SAAL III . . . . .TUE 10:40 TO 12:20

Data Fusion, Watermarking and Radar
Session Chair: **Andrea Garzelli,** Univ. degli Studi di Siena (Italy)

10:40: **Evaluating the label efficiency of contrastive self-supervised learning for multi-resolution satellite imagery**, Jules Bourcier, Institut National de Recherche en Informatique et en Automatique, Grenoble INP (France) and Univ. Grenoble Alpes, CNRS (France) and Preligens (France); Gohar Dashyan, Preligens (France); Jocelyn Chanussot, Karteek Alahari, Institut National de Recherche en Informatique et en Automatique, Grenoble INP (France) and Univ. Grenoble Alpes, CNRS (France). . . . . [12267-20]

11:00: **Multimodal fusion transformer for visual question answering in remote sensing**, Tim Siebert, Kai Norman Clasen, Mahdyar Ravanbakhsh, Begüm Demir, Technische Univ. Berlin (Germany) . . . . [12267-21]

11:20: TBA3. . . . . [12267-54]

11:40: **Unsupervised semantic segmentation of radar sounder data using contrastive learning**, Elena Donini, Fondazione Bruno Kessler (Italy); Mattia Amico, Lorenzo Bruzzone, Univ. degli Studi di Trento (Italy); Francesca Bovolo, Fondazione Bruno Kessler (Italy). . . . . [12267-23]

12:00: **Advanced deep learning architectures for accurate detection of subsurface tile drainage pipes from remote sensing images**, Tom-Lukas Breitkopf, Leonard Hackel, Mahdyar Ravanbakhsh, Technische Univ. Berlin (Germany); Anne-Karin Cooke, Sandra Willkommen, Stefan Broda, Bundesanstalt für Geowissenschaften und Rohstoffe (Germany); Begüm Demir, Technische Univ. Berlin (Germany) . . . . [12267-24]

Lunch/Exhibition Break . . . . Tue 12:20 to 13:50

SESSION 6
LOCATION: SAAL III . . . . .TUE 13:50 TO 15:20

SAR and Radar Data Analysis I
Session Chair: **Lorenzo Bruzzone,** Univ. degli Studi di Trento (Italy)

13:50: **Science goals of the ESA's Scout-2 HydroGNSS mission** (*Invited Paper*), Nazzareno Pierdicca, Sapienza Univ. di Roma (Italy) . . . . . . [12267-25]

14:20: **A multi-layer simulation technique for modeling large and small-scale scattering in radar sounder data**, Marco Cortellazzi, Univ degli Studi di Trento (Italy); Sanchari Thakur, Elisa Sbalchiero, Lorenzo Bruzzone, Univ. degli Studi di Trento (Italy) . . . . [12267-26]

14:40: **An FFT-based CNN-Transformer Encoder for Semantic Segmentation of Radar Sounder Signal**, Raktim Ghosh, Fondazione Bruno Kessler (Italy) and Univ. degli Studi di Trento (Italy); Francesca Bovolo, Fondazione Bruno Kessler (Italy). . . . . [12267-27]

15:00: **Panchromatic enhanced SAR imagery: a neural representation approach**, Kenneth Tran, North Carolina State Univ. (United States); Wesam Sakla, Lawrence Livermore National Lab. (United States); Hamid Krim, North Carolina State Univ. (United States) and U.S. Army Research Office (United States). . . . . [12267-28]

Coffee Break. . . . . Tue 15:20 to 15:50

SESSION 7
LOCATION: SAAL III . . . . .TUE 15:50 TO 17:30

SAR and Radar Data Analysis II
Session Chair: **Nazzareno Pierdicca,** Sapienza Univ. di Roma (Italy)

15:50: **Exploiting artificial reflectors for SAR interferometry applications**, Davide Oscar Nitti, Raffaele Nutricato, Khalid Tijani, GAP S.r.l. (Italy); Fabio Bovenga, Alberto Refice, Istituto per il Rilevamento Elettromagnetico dell'Ambiente, Consiglio Nazionale delle Ricerche (Italy); Roberto Bellotti, Giovanni Preziosa, Antonio Mongelli, Univ. degli Studi di Bari Aldo Moro (Italy) . . . . [12267-29]

16:10: **Determination of surface deformations in the zone of nuclear power plant Kozloduy**, Hristo S. Nikolov, Space Research and Technology Institute (Bulgaria); Mila S. Atanasova-Zlatareva, National Institute in Geophysics, Geodesy, and Geography (Bulgaria) . . . . [12267-30]

16:30: **Landslide detection using InSAR time series in the Kalekoy dam reservoir (Bingol, Türkiye)**, Beste Tavus, Hacettepe Univ. (Turkey); Sultan Kocaman, Hacettepe Univ. (Turkey) and ETH Zurich (Switzerland); Hakan A. Nefeslioglu, Eskisehir Technical Univ. (Turkey). . . . . [12267-31]

16:50: **Remote surveillance practices of surface displacements for Kazakhstan and Azerbaijan oil and gas fields and pipelines using multitemporal radar satellite interferometry**, Emil Bayramov, Nazarbayev Univ. (Kazakhstan); Manfred Buchroithner, TU Dresden (Germany); Martin Kada, TU Berlin (Germany); Yermukhan Zhuniskenov, Nazarbayev Univ. (Kazakhstan) . . . . [12267-32]

17:10: **Estimation of snow wetness using hybrid polarimetric RISAT-1 SAR datasets**, Shubham Awasthi, Indian Institute of Technology Roorkee (India); Divyesh Varade, Indian Institute of Technology Jammu (India); Praveen Kumar Thakur, Indian Institute of Remote Sensing, Indian Space Research Organisation (India); Kamal Jain, Indian Institute of Technology Roorkee (India) . . . . [12267-33]

POSTER SESSION
LOCATION: FOYER ESTREL SAAL ESTREL HALL. . . . . 17:30 TO 19:00

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 AM–17:00 hrs

View poster presentation guidelines and set-up instructions at https://spie.org/conferences-and-exhibitions/sensors-and-imaging/presenters/prepare-to-present/poster-presentation-guidelines

Using FY-3 remote sensing to monitor the evolution of El Niño events, Wanjiao Song, National Satellite Meteorological Ctr. (China); Tao Lian, State Key Laboratory of Satellite Ocean Environment Dynamics, Second Institute of Oceanography (China); Peng Zhang, National Satellite Meteorological Center (National Center for Space Weather) (China); Ling Sun, National Satellite Meteorological Ctr. (China) . . . . [12267-34]

A task-specific SeamCarving approach based on ternary mask map for remote sensing image manipulation, Ruijie Xu, Fei Ma, Mengxuan Xin, Liang Huang, Yinzhe Cui, Jin Hu, Beijing Univ. of Chemical Technology (China). . . . . [12267-35]

Calibration of a multiscale affine structured light sensor, Pascal Kern, Philipp Middendorf, Markus Kästner, Eduard Reithmeier, Leibniz Univ. Hannover (Germany). . . . . [12267-36]

AI-based super resolution of Khalifa satellite imagery using generative adversarial networks (GAN), Alavikunhu Panthakkan, Univ. of Dubai (United Arab Emirates); Saeed Al Mansoori, Mohammed Bin Rashid Space Ctr. (United Arab Emirates); Hussain Al-Ahmad, Univ. of Dubai (United Arab Emirates); Murshid P. Abdul Rasheed, Rahul Rajeev, Nisha Shamsudin, Ilahia College of Engineering & Technology (India) . . . . [12267-37]

Search for the focus of rotational quasi-symmetry of order 2 based on the Jacquard measure for binary raster images, Oleg Seredin, Daniil Lyahov, Olesia Kushnir, Tula State Univ. (Russian Federation); Nikita Lomov, Tula State Univ. (Russian Federation) and Federal Research Ctr. Computer Science and Control (Russian Federation) . . . . [12267-38]

Weakly supervised ship detection in remote sensing images, Chen Guo, Zhiwen Tan, Beihang Univ. (China); Meng An, Institute of Spacecraft System Engineering, CAST (China); Zhiguo Jiang, Haopeng Zhang, Beihang Univ. (China) . . . . [12267-39]

Star centroid extraction in a single-line detector array, Zhexin Han, Sijia Qiao, Haopeng Zhang, Beihang Univ. (China). . . . . [12267-40]

Borescope 3D measurement combining fringe projection and structure-from-motion, Moritz von Wrangel, Markus Kästner, Eduard Reithmeier, Leibniz Univ. Hannover (Germany). . . . . [12267-41]

Detection and classification of ice-water interfaces in terrestrial radar sounder data, Sanchari Thakur, Univ. degli Studi di Trento (Italy); Angelica Fabrello, Exprivia S.p.A. (Italy); Lorenzo Bruzzone, Univ. degli Studi di Trento (Italy) . . . . [12267-42]

Multi-domain vision based character recognition based on auto labeled hand tracking data learning, Junha Lee, Hong-In Won, Korea Institute of Industrial Technology (Korea, Republic of); Min Young Kim, Kyungpook National Univ. (Korea, Republic of); Byeong Hak Kim, Korea Institute of Industrial Technology (Korea, Republic of) . . . . [12267-43]

Accuracy improvement with input image upscaling for in orbit object detection, Daeun Seo, Jinse Kwon, Chungnam National Univ. (Korea, Republic of); Hyungshin Kim, Chungnam National University (Korea, Republic of) . . . . [12267-45]

Research of correlation characteristics of new code sequences based on persymmetric quasi-orthogonal circulants for MIMO radar systems, Evgeniy K. Grigoriev, Saint-Petersburg State Univ. of Aerospace Instrumentation (Russian Federation) . . . . [12267-46]

Scanned leaves boundary detection based on the consistent one-class segmentation, Evgeny A. Semenishchev, Moscow State Univ. of Technology "STANKIN" (Russian Federation); dmitry Liakhov, nicolay Mityugov, Inessa Gracheva, Andrey Kopylov, Oleg Seredin, Tula State University (Russian Federation); Ivan Valkov, Lomonosov Moscow State University (Russian Federation); Khiril Tiras, Institute of Theoretical and Experimental Biophysics (Russian Federation). . . . . [12267-47]

ADHHI airborne hyperspectral imager: camera structure and geometric correction, Jieke Dong, Yansong Duan, Qi Zhou, Xinbo Zhao, Wuhan University (China) . . . . [12267-48]

Artificial structures identification using PolInSAR data, Houda Latrache, Mounira Ouarzeddine, Boularbah Souissi, Univ. des Sciences et de la Technologie Houari Boumediene (Algeria) . . . . [12267-50]

CONFERENCE 12268

Monday–Wednesday 5–7 September 2022 • Proceedings of SPIE Vol. 12268

Earth Resources and Environmental Remote Sensing/GIS Applications XIII

Conference Chairs: **Karsten Schulz,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Ulrich Michel,** ROSEN Germany GmbH (Germany); **Konstantinos G. Nikolakopoulos,** Univ. of Patras (Greece)

Programme Committee: **Maria Libera Battagliere,** Agenzia Spaziale Italiana (Italy); **Markus Boldt,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Dimitri Bulatov,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Valerio Gagliardi,** Univ. degli Studi di Roma Tre (Italy); **Pierre Karrasch,** TU Dresden (Germany); **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 5 SEPTEMBER

SESSION 1
LOCATION: ESTREL HALL C6 . . . . MON 11:00 TO 12:20

Sensors and Platforms

Session Chairs: **Karsten Schulz,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Konstantinos G. Nikolakopoulos,** Univ. of Patras (Greece)

11:00: **SAR images and random forest for spatiotemporal mapping and monitoring of mangroves along coastal arid region**, Diena Aldogom, Univ. of Dubai (United Arab Emirates); Rami Al-Ruzouq, Univ. of Sharjah (United Arab Emirates); Basma Samour, Univ. of Dubai (United Arab Emirates); Saeed H. AlMansoori, Meera R. AlShamsi, Mohammed Bin Rashid Space Ctr. (United Arab Emirates) . . . . [12268-1]

11:20: **On the field geometrical characterization of illegal micro-dumps by means of RPAS survey with depth camera**, Luca Cicala, Donato Amitrano, Mariana Poderico, Francesco Tufano, Ctr. Italiano Ricerche Aerospaziali (Italy) . . . . [12268-2]

11:40: **Instantaneous bidirectional reflectance distribution function measurement using a mobile device**, Seul Ki Yang, Hanwha Systems Co., Ltd. (Korea, Republic of) and Yonsei Univ. (Korea, Republic of); In-Ung Song, Yonsei Univ. (Korea, Republic of) and Korea Research Institute of Standards and Science (Korea, Republic of); Ho-Soon Yang, Korea Research Institute of Standards and Science (Korea, Republic of); Sug-Whan Kim, Yonsei Univ. (Korea, Republic of) . . . . [12268-3]

12:00: **Sensor-agnostic DEM-assisted ML-based modeling of the flood extent in conditions hindered by clouds or satellite revisit time**, Alen Berta, CGI (Germany) GmbH & Co., KG. (Germany); Andrea Narja Heberling, CGI (Germany) GmbH & Co. (Germany); Jan Haase, NORDAKADEMIE (Germany) . . . . [12268-55]

Lunch Break . . . . Mon 12:20 to 14:00

SESSION 2
LOCATION: ESTREL HALL C6 . . . . MON 14:00 TO 15:00

Environmental Monitoring Concepts

Session Chairs: **Ana Claudia Moreira Teodoro,** Univ. do Porto (Portugal); **Christine Wessollek,** TU Dresden (Germany)

14:00: **Evaluation of the NEON dataset for the automatic detection of treetops and delineation of tree crowns in American and German mixed forests**, Jessica Palka, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Andreas Lenz, Wolfgang Middelmann, Fraunhofer IOSB (Germany); Martin Weinmann, Karlsruher Institut für Technologie (Germany) . . . . [12268-7]

14:20: **Remote mapping of soil erosion risk in Iceland**, Daniel Fernández, Fléttan (Spain); Marco Pizzolato, Univ. of Iceland (Iceland); Eromanga Adermann, Capgemini Australia (Australia); Christina Rodríguez, Univ. of Iceland (Iceland); Roman Pechenkin, CCP Games (Iceland) . . . . [12268-8]

14:40: **An approach for determination of sea surface plastic waste transport routes using Copernicus Marine Service products**, Miroslav Tsvetkov, Nikola Vaptsarov Naval Academy (Bulgaria). . . . . [12268-9]

Coffee Break. . . . . Mon 15:00 to 16:15

REMOTE SENSING PLENARY
LOCATION: CONVENTION HALL I-D . . . . .16:15 TO 18:00

16:15 to 16:30: **Welcome Address and Plenary Speaker Introduction**
Karsten Schulz,Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

16:30: **The German environmental hyperspectral satellite EnMAP: mission update and related science activities** *(Plenary)*
Sabine I. Chabrillat, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ (Germany) and Leibniz Univ. Hannover (Germany)

17:15: **The space debris challenge: ESA's answer** *(Plenary)*
Holger Krag, European Space Operations Ctr. (Germany

TUESDAY 6 SEPTEMBER

SESSION 3
LOCATION: ESTREL HALL C6 . . . . .TUE 9:00 TO 10:00

Remote Sensing for Archaeology, Preservation of Cultural and Natural Heritage

Session Chairs: **Kyriacos Themistocleous,** Cyprus Univ. of Technology (Cyprus); **Pierre Karrasch,** TU Dresden (Germany)

9:00: **Synergistic use of UAV and TLS data for precise rockfall monitoring over a hanging monastery.**, Aggeliki Kyriou, Konstantinos G. Nikolakopoulos, Ioannis K. Koukouvelas, Univ. of Patras (Greece) . . [12268-11]

9:20: **HBIM for Cultural Heritage: The Case Study of Panayia Karmiotissa Church**, Kyriacos Themistocleous, ERATOSTHENES Ctr. of Excellenc (Cyprus); Andreas Anayiotos, ERATOSTHENES Ctr. of Excellence (Cyprus), Cyprus Univ. of Technology (Cyprus); Marinos Ioannides, Cyprus Univ. of Technology (Cyprus). . . . . [12268-12]

9:40: **The Use of Digital Twin Models to Document Cultural Heritage Monuments**, Kyriacos Themistocleous, ERATOSTHENES Ctr. of Excellence (Cyprus); Evagoras Evagorou, Christodoulos Mettas, Diofantos G. Hadjimitsis, ERATOSTHENES Ctr. of Excellence (Cyprus), Cyprus Univ. of Technology (Cyprus)) . . . . [12268-13]

Coffee Break. . . . . .Tue 10:00 to 10:30

SESSION 4
LOCATION: ESTREL HALL C6 . . . . **TUE 10:30 TO 11:30**

Satellite RS and Ground-based Nondestructive Technologies in Civil and Environmental Engineering I

Session Chair: **Livia Lantini,** Univ. of West London (United Kingdom)

10:30: **Assessing the root system of urban trees by geostatistical analysis of GPR data**, Livia Lantini, Univ. of West London (United Kingdom); Sebastiano Trevisani, Univ. Iuav di Venezia (Italy); Fabio Tosti, Amir M. Alani, Univ. of West London (United Kingdom) . . . . [12268-14]

10:50: **Integrated health monitoring of masonry arch bridges by remote sensing and ground penetrating radar technologies**, Valerio Gagliardi, Luca Bianchini Ciampoli, Fabrizio D'Amico, Andrea Benedetto, Univ. degli Studi di Roma Tre (Italy) . . . . [12268-15]

11:10: **Training data generation for machine learning using GPR images**, Markus Boldt, Antje Thiele, Karsten Schulz, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12268-17]

Lunch/Exhibition Break . . . . Tue 11:30 to 13:40

SESSION 5
LOCATION: ESTREL HALL C6 . . . . **TUE 13:40 TO 15:00**

Satellite RS and Ground-based Nondestructive Technologies in Civil and Environmental Engineering II

Session Chair: **Valerio Gagliardi,** Univ. degli Studi di Roma Tre (Italy)

13:40: **Automatic damage detection of bridge joints and road pavements by artificial neural networks (ANNs)**, Valerio Gagliardi, Francesco Bella, Giuseppe Sansonetti, Roberto Previti, Lucio Menghini, Univ. degli Studi di Roma Tre (Italy). . . . . [12268-18]

14:00: **A novel bridge monitoring system implementing ground-based, structural and remote sensing information into a GIS-based catalogue**, Gianluca Quinci, Valerio Gagliardi, Luigi Pallante, Jhon Romer Diezmos Manalo, Antonio Napolitano, Luca Bertolini, Luca Bianchini Ciampoli, Pietro Meriggi, Fabrizio D'Amico, Fabrizio Paolacci, Univ. degli Studi di Roma Tre (Italy) . . . . [12268-20]

14:20: **Implementation of an interoperable BIM platform integrating ground-based and remote sensing information for network-level infrastructures monitoring**, Fabrizio D'Amico, Luca Bertolini, Antonio Napolitano, Jhon Romer Diezmos Manalo, Valerio Gagliardi, Luca Bianchini Ciampoli, Univ. degli Studi di Roma Tre (Italy) . . . . [12268-21]

14:40: **Satellite remote sensing and integrated technologies for infrastructures monitoring: advances and perspectives of ASI's satellite-data exploitation**, Luigi D'Amato, Maria Libera Battagliere, Laura Candela, Alessandro Coletta, Agenzia Spaziale Italiana (Italy) . . . . [12268-22]

Coffee Break. . . . . Tue 15:00 to 15:30

SESSION 6
LOCATION: ESTREL HALL C6 . . . . **TUE 15:30 TO 17:10**

Infrastructures and Urban Areas

Session Chairs: **Markus Boldt,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Ulrich Michel,** ROSEN Germany GmbH (Germany)

15:30: **Multiparametric microsensor monitoring platform of the Enceladus Hellenic supersite: the PROION project**, Konstantinos G. Nikolakopoulos, Aggeliki Kyriou, Efthimios Sokos, Stathis Bousias, Elias Strepelias, Peter Groumpos, Vassiliki Mpelogianni, Zafeiria Roumelioti, Anna Serpetsidaki, Dimitrios Paliatsas, Panagiotis Stephanopoulos, Univ. of Patras (Greece); Athanassios Ganas, National Observatory of Athens (Greece); Yiannis Maroufidis, Geosystems Hellas (Greece); Theodoros Athanasopoulos, ES Systems (Greece) . . . . [12268-23]

15:50: **Noninvasive tree roots detection by satellite imagery and electrical tomography at the edge between rain forest and high voltage lines**, Asher Perez, Tom Trigano, SCE Engineering College (Israel); Harold Gwet, Univ. of Yaoundé (Cameroon) . . . . [12268-24]

16:10: **The study of urban heat island effect in Cyprus using Sentinel-3 data**, Kyriacos Themistocleous, ERATOSTHENES Ctr. of Excellence (Cyprus) and Cyprus Univ. of Technology (Cyprus). . . . . [12268-26]

16:30: **Spatial pattern change analysis of new Egyptian capital based on VIIRS/DNB**, Xi Zhang, Shi Qiu, Yu Zhang, Haodong Cui, Aerospace Information Research Institute (China) . . . . [12268-27]

16:50: **Comparison of the IRS and SPOT satellite data for shoreline mapping: the case of Katakolo bay, Ilia prefecture, Greece**, Dionysios N. Apostolopoulos, Konstantinos G. Nikolakopoulos, Univ. of Patras (Greece). . . . . [12268-6]

POSTER SESSION
LOCATION: FOYER ESTREL SAAL ESTREL HALL . . . . **17:30 TO 19:00**

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 AM–17:00 hrs

View poster presentation guidelines and set-up instructions at https://spie.org/conferences-and-exhibitions/sensors-and-imaging/ presenters/prepare-to-present/poster-presentation-guidelines

Aster spectral band ratios for ore geology: case study of Adjara-Trialety folded zone, Georgia, Giorgi Mindiashvili, Tbilisi State Univ. (Georgia) . . . . [12268-40]

Selection of effective band combination for optical satellite sensor in landslide detection by U-Net, Tomohisa Konishi, Seiji Ito, Yoshinari Oguro, Hiroshima Institute of Technology (Japan) . . . . [12268-41]

Synergy of UAV data and in situ measurements for the shoreline mapping in Arkoudi beach, western Greece, Dionysios N. Apostolopoulos, Konstantinos G. Nikolakopoulos, Univ. of Patras (Greece) . . . . [12268-42]

The potential of spectral unmixing method applied to PRISMA hyperspectral images in the identification of Li minerals: an evaluation for prospecting purposes, Douglas Santos, Univ. do Porto (Portugal); Joana Cardoso-Fernandes, Alexandre Martins Campos de Lima, Ana Claudia M. Teodoro, Univ. do Porto (Portugal) and Instituto de Ciências da Terra (Portugal) . . . . [12268-43]

The influence of DSM on rock-fall simulation: a case study from western Greece, Maria Kakavas, Konstantinos G. Nikolakopoulos, Univ. of Patras (Greece). . . . . [12268-44]

Spatiotemporal changes of land use in Henan section of the Yellow River basin from 2008 to 2017, Xiaoping Zhang, Luoyang Normal Univ. (China); Xinhong Ding, Luoyang Normal Univ. (China); Huaipeng Liu, Luoyang Normal Univ. (China); Yongyong Li, Luoyang Normal Univ. (China); Chuancai Zhang Zhang, Zehang Sun, Luoyang Normal Univ. (China) . . . . [12268-45]

Evaluation of vegetation index correction method for NDVI time series analysis based on MODIS data, Suyoung Sim, Kyung-Soo Han, Daeseong Jung, Jongho Woo, Pukyong National Univ. (Korea, Republic of). . . [12268-46]

Estimation of hourly pm 2.5 in Korea using machine learning from geostationary satellite data, Nayeon Kim, Yugyeong Byeon, Donghyun Jin, Kyung-Soo Han, Pukyong National Univ. (Korea, Republic of) . . . . . [12268-47]

Automatic ship detection on Sentinel-2A image using random forest, Uujin Jeon, Nayeon Kim, Jongho Woo, Kyung-Soo Han, Pukyong National Univ. (Korea, Republic of) . . . . [12268-48]

Application of chaotic sequences to expand the spectrum, Galina Cherneva, Todor Kableshkov Univ. of Transport (Bulgaria) and South-West Univ. "Neofit Rilski" (Bulgaria); Valentina Hristova, Space Research and Technology Institute (Bulgaria) and Todor Kableshkov Univ. of Transport (Bulgaria); Denitsa Borisova, Anna Bouzekova-Penkova, Space Research and Technology Institute (Bulgaria) . . . . [12268-49]

Application of ranking correlation in synthesis of resistance-resistant signals, Galina Cherneva, Todor Kableshkov Univ. of Transport (Bulgaria) and South-West Univ. "Neofit Rilski" (Bulgaria); Valentina Hristova, Space Research and Technology Institute (Bulgaria) and Todor Kableshkov Univ. of Transport (Bulgaria); Denitsa Borisova, Anna Bouzekova-Penkova, Space Research and Technology Institute (Bulgaria) . . . . [12268-50]

Cloud detection using Sentinel-2/MSI satellite imagery, Yugyeong Byeon, Suyoung Sim, Nayeon Kim, Kyung-Soo Han, Pukyong National Univ. (Korea, Republic of). . . . . [12268-51]

Monitoring and analysis of changes of spruce in the Korean peninsula based on satellite data, Jongho Woo, Kyung-Soo Han, Pukyong National Univ. (Korea, Republic of); Seongwon Choi, School of Integrated Science for Sustainable Earth & Environmental Disaster (Korea, Republic of); Uujin Jeon, Pukyong National Univ. (Korea, Republic of) . . . . [12268-52]

Integrated field and remote sensing data for tropical forest and trees-outside-forest (TOF) resources inventory, Bashir Adamu, Ibrahim Muhammed, Abdur-Rahman Ismaila, Modibbo Adama Univ. of Technology, Yola (Nigeria) . . . . [12268-53]

The impacts of urbanization on groundwater resources in Jebel Ali, Dubai area, Abdulaziz Aljaberi, Sanad Fareaa, UAEU - NSSTC (United Arab Emirates) . . . . [12268-54]

SPIE REMOTE SENSING TECHNICAL CONFERENCE 12268

WEDNESDAY 7 SEPTEMBER

SECURITY + DEFENCE PLENARY

LOCATION: CONVENTION HALL I-D . . . . **9:00 TO 10:40**

9:00 to **Welcome Address and Plenary Speaker Introduction**
9:10: **Karin Stein,** Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

9:10: **Directed energy, the answer for the new threats** *(Plenary)*
Markus Jung, Rheinmetall Waffe Munition GmbH (Germany)

9:55: **SWIR and MWIR laser sources for optronics and directed energy** *(Plenary)*
Marc Eichhorn, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) and Karlsruhe Institute of Technology (Germany)

Coffee Break. . . . . Wed 10:40 to 11:00

SESSION 7

LOCATION: ESTREL HALL C6 . . . . **WED 11:00 TO 12:00**

Hazard Mitigation Geologic Applications I

Session Chair: **Konstantinos G. Nikolakopoulos,**
Univ. of Patras (Greece)

11:00: **National scale classification of landslide types by a data–driven approach and artificial neural networks**, Lorenzo Palombi, Istituto di Fisica Applicata "Nello Carrara" (Italy); Gabriele Amato, Istituto di Fisica Applicata "Nello Carrara" (Italy) and Sapienza Univ. di Roma (Italy); Valentina Raimondi, Istituto di Fisica Applicata "Nello Carrara" (Italy) . . . . [12268-28]

11:20: **Assessment of landslide susceptibility in Garhwal Himalayas using random forest model**, Ranjeet Singh, Parmanand Kumar, Forest Research Institute (India) . . . . [12268-29]

11:40: **A review of the literature on spatial prediction of floods using machine learning models**, Sonia Hajji , Abdenbi Elaloui, Abdelghani Boudhar, Mustapha Namous, Univ. Sultan Moulay Slimane (Morocco) . . . . [12268-31]

Lunch/Exhibition Break . . . . Wed 12:00 to 13:10

SESSION 8

LOCATION: ESTREL HALL C6 . . . . **WED 13:10 TO 14:30**

Processing Methodologies

Session Chairs: **Dimitri Bulatov,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany);
Karsten Schulz, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13:10: **Vegetation phenology from Sentinel 2 data: a GIS open source application**, Lia Duarte, Sofia Scomparim, Ana Claudia M. Teodoro, Univ. do Porto (Portugal) . . . . [12268-32]

13:30: **Exploring fusion techniques in U-Net and Deeplab architectures for multimodal landcover classification**, Dimitri Bulatov, Kevin Qiu, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Lina E. Budde, Dorota Iwaszczuk, Technische Univ. Darmstadt (Germany) . . . . [12268-33]

13:50: **Evaluation of different convolutional neural network models for building segmentation and classification**, Loghman Moradi, Erfan Hasanpoor Zaryabi, Univ. of Tehran (Iran, Islamic Republic of); Bahareh Kalantar, RIKEN Ctr. for Advanced Intelligence Project (Japan); Alfian Abdul A. Halin, Univ. Putra Malaysia (Malaysia); Naonori Ueda, RIKEN Ctr. for Advanced Intelligence Project (Japan) . . . . [12268-34]

14:10: **Assessment of decadal land use land cover change using random forest classifier in Google Earth engine for Himachal Pradesh, India**, Smriti Thakur , Kumaun Univ. (India); Sher Singh Samant, Rakesh Kumar Singh, G.B.Pant National Institute of Himalayan Environment (India) [12268-36]

SESSION 9

LOCATION: ESTREL HALL C6 . . . . **WED 14:30 TO 15:30**

Hazard Mitigation Geologic Applications II

Session Chairs: **Ulrich Michel,** ROSEN Germany GmbH (Germany);
Konstantinos G. Nikolakopoulos, Univ. of Patras (Greece)

14:30: **Ten-year wildfire mapping using satellite imagery: the case study of western Greece**, Eirini Dimitriou, Aggeliki Kyriou, Konstantinos G. Nikolakopoulos, Univ. of Patras (Greece) . . . . [12268-37]

14:50: **Sentinel-1 and ALOS data for lineament extraction: a comparative study**, Joana Cardoso-Fernandes, Ana Claudia M. Teodoro, Alexandre Martins Campos de Lima, Univ. do Porto (Portugal); Julian Menuge, Univ. College Dublin (Ireland); Marco Brönner, NGU (Norway); Ralf Steiner, Geo Unterweissacher GmbH (Austria) . . . . [12268-38]

15:10: **Applying self-organizing maps to characterize hyperspectral drill core data from three ore prospects in Northern Finland**, Kati S. Laakso, Samuli Haavikko, Markku Korhonen, Juha Köykkä, Maarit Middleton, Vesa Nykänen, Jarmo Rauhala, Akseli Torppa, Johanna Torppa, Tuomo Törmänen, Geological Survey of Finland (Finland). . . . . [12268-39]

CONFERENCE 12269

Monday 5 September 2022 • Proceedings of SPIE Vol. 12269

Remote Sensing Technologies and Applications in Urban Environments VII

Conference Chairs: **Thilo Erbertseder,** Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Nektarios Chrysoulakis,** Foundation for Research and Technology-Hellas (Greece); **Ying Zhang,** Natural Resources Canada (Canada)

Programme Committee: **Matthias Budde,** Karlsruhe Institute of Technology (Germany); **Thomas Esch,** Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Wieke Heldens,** Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Zina Mitraka,** Foundation for Research and Technology-Hellas (Greece); **Christopher Small,** The Earth Institute (United States); **Carlos Tavares Calafate,** Univ. Politécnica de Valencia (Spain)

MONDAY 5 SEPTEMBER

SESSION 1
LOCATION: ESTREL HALL C5 . . . . **MON 9:00 TO 10:20**

Smart Cities
Session Chair: **Ying Zhang,** Natural Resources Canada (Canada)

9:00: **Mobile mapping platform with integrated end-to-end data processing chain for smart city applications**, Bastian Stahl, Alexander Reiterer, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany) . . . . [12269-1]

9:20: **Overview of 3D point cloud annotation and segmentation techniques for smart city applications**, Dominik Merkle, Univ. of Freiburg (Germany) and Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Alexander Reiterer, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany) and Univ. of Freiburg (Germany). . . . . . . [12269-2]

9:40: **Fluorescence LIDAR experiments and their integration in a user-friendly platform to support inspection of railway bridges**, Lorenzo Palombi, Istituto di Fisica Applicata "Nello Carrara" (Italy); Simone Durazzani, TE.SI.FER. Srl (Italy); Donatella Guzzi, Cinzia Lastri, Vanni Nardino, Roberto Olmi, Istituto di Fisica Applicata "Nello Carrara" (Italy); Fabrizio Costantino, Daniele Poggi, Nicolò Renzoni, TE.SI.FER. Srl (Italy); Stefano Durazzani, Gianni Frilli, Durazzani srl (Italy); Valentina Raimondi, Istituto di Fisica Applicata "Nello Carrara" (Italy). . . . . [12269-3]

10:00: **Multisource-data-fusion for the digitization of critical infrastructural elements**, Simon Stemmler, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Timo Kaufmann, Kaulquappe GmbH (Germany); Maria Justine Bange, MKP GmbH (Germany); Steffen Marx, TU Dresden (Germany); Katharina Klemt-Albert, RWTH Aachen Univ. (Germany); Alexander Reiterer, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany) and Univ. of Freiburg (Germany); Dominik Merkle, Univ. of Freiburg (Germany) . . . . [12269-4]

Coffee Break. . . . . Mon 10:20 to 10:50

SESSION 2
LOCATION: ESTREL HALL C5 . . . . **MON 10:50 TO 12:30**

Urban Planning
Session Chair: **Nektarios Chrysoulakis,** Foundation for Research and Technology-Hellas (Greece)

10:50: **Evolution of ecological patterns of land use changes in European metropolitan areas**, Xu Zhang, Blanca Arellano, Josep Roca, Univ. Politècnica de Catalunya (Spain) . . . . [12269-5]

11:10: **Research of NPP-VIIRS nighttime light data for modeling the GDP of Chongqing, China**, Yu Zhang, Aerospace Information Research Institute (China); Shi Qiu, Aerospace Information Research Institute (China); Xi Zhang, Aerospace Information Research Institute (China); Haodong Cui, Aerospace Information Research Institute (China) . . . . [12269-6]

11:30: **Mobile mapping system for high-resolution imaging**, Philipp von Olshausen, Stefan Blattmann, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany); Alexander Reiterer, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany) and Sustainable Systems Engineering (INATECH), Univ. of Frieburg (Germany); Bastian Stahl, Fraunhofer-Institut für Physikalische Messtechnik IPM (Germany) . . . [12269-7]

11:50: **Thermal anomaly and rooftop unit (RTU) detection in buildings through machine learning**, Samuel Fernandes, Rohullah Najibi, Anand Prakash, Lawrence Berkeley National Lab. (United States); Reshma Singh, LBL (United States); Jessica Granderson, Rohullah Najibi, Marina Zafiris, Lawrence Berkeley National Lab. (United States). . . . . [12269-9]

12:10: **Industrial/metal roof detection from hyperspectral image in an urban scene**, Chaman Banolia, Shailesh Deshpande, Tata Consultancy Services Ltd. (India); Balamuralidhar P., Tata Consultancy Services, Ltd. (India) . . . . [12269-21]

Lunch/Exhibition Break . . . . Mon 12:30 to 14:00

SESSION 3
LOCATION: ESTREL HALL C5 . . . . **MON 14:00 TO 15:00**

Urban Air Quality and Climate
Session Chair: **Thilo Erbertseder,**
Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

14:00: **Application in urban CO_2 emissions using multisource carbon satellite data**, Jing Zhao, Tengfei Yang, Aerospace Information Research Institute (China); Guoqing Li, Aerospace Information Research Institute (China). . . . . [12269-10]

14:20: **Analysis of the relationship between spatial urban expansion and temperature utilizing remote sensing and GIS techniques in the Accra metropolis in Ghana**, Bernard Fosu Frimpong, Brandenburgische Technische Universität Cottbus - Senftenberg (Germany). . . . . [12269-12]

14:40: **Estimation and prediction of UHI in relation to spatial variations in urban green spaces and built-up intensity using machine learning techniques**, Sutapa Bhattacharjee, Indian Institute of Technology Guwahati (India); Payel Ghosh Dastidar, Assam Agricultural Univ. (India); Rishikesh Bharti, Indian Institute of Technology Guwahati (India) . . . . [12269-14]

Coffee Break. . . . . Mon 15:00 to 16:15

REMOTE SENSING PLENARY
LOCATION: CONVENTION HALL I-D . . . . **16:15 TO 18:00**

16:15 to **Welcome Address and Plenary Speaker Introduction**
16:30: **Karsten Schulz,** Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

16:30: **The German environmental hyperspectral satellite EnMAP: mission update and related science activities** *(Plenary)*
Sabine I. Chabrillat, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ (Germany) and Leibniz Univ. Hannover (Germany)

17:15: **The space debris challenge: ESA's answer** *(Plenary)*
Holger Krag, European Space Operations Ctr. (Germany

TUESDAY 6 SEPTEMBER

POSTER SESSION
LOCATION: FOYER ESTREL SAAL ESTREL HALL. . . . . 17:30 TO 19:00

Conference attendees are invited to attend the Sensors + Imaging
Poster Session on Tuesday evening.
Come view the posters, enjoy light refreshments,
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Poster Setup: Tuesday 10:00 AM–17:00 hrs

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presenters/prepare-to-present/poster-presentation-guidelines

Comparative characteristics of the accuracy of determining the azimutal coordinates of objects in a two-positional system of small on-board radars, Evgeniy K. Grigoriev, Vadim A. Nenashev, Saint-Petersburg State Univ. of Aerospace Instrumentation (Russian Federation) . . . . [12269-17]

Semantic segmentation of UAV image using combined unet and heterogeneous UAV imagery datasets, Ahram Song, Kyungpook National Univ. (Korea, Republic of) . . . . [12269-18]

Reconstruction of 3-D Models of Infrastructure Objects from Satellite Images Based on Typed Elements, Maretta Kazaryan, North Ossetian State Medical Academy (Russian Federation); A. Richter, AEROCOSMOS Research Institute for Aerospace Monitoring (Russian Federation); A. Gvozdev, Moscow State Univ. of Geodesy and Cartography (Russian Federation); A. Murynin, Federal Research Ctr. "Computer Science and Control" (Russian Federation); V. Kozub, D. Pukhovsky, M. Shakhramanyana, AEROCOSMOS Research Institute for Aerospace Monitoring (Russian Federation); Evgeny A. Semenishchev, Moscow State Univ. of Technology "STANKIN" (Russian Federation) . . . . [12269-15]

Information Modeling Technologies in the Tasks of Construction and Operation of Buildings and Structures, Maretta Kazaryan, North Ossetian State Medical Academy (Russian Federation); M Shakhramanyan, Financial University under the Government of the Russian Federation (Russian Federation); Evgeny A. Semenishchev, Moscow State Univ. of Technology "STANKIN" (Russian Federation). . . . . [12269-19]

Flood risk analysis and mapping in Henan Province using remotely sensed data and GIS techniques, Xiaoping Zhang, Yongyong Li, Luoyang Normal Univ (China); Xiaoqing Ma, Luoyang Normal Univ. (China); Zehang Sun, Luoyang Normal Univ (China); Dongsheng Liu, Piesat Information Technology Co., Ltd. (China); Ying Lv, Luoyang Normal Univ. (China). . . . . [12269-16]

An approach to urban built-up extraction using encoder-decoder based segmentation model and ALOS 2 polsar data, RUMA ADHIKARI, Kamal Jain, IIT ROORKEE (India) . . . . [12269-22]

CONFERENCE 12270

Monday 5 September 2022 • Proceedings of SPIE Vol. 12270

Target and Background Signatures VIII

Conference Chairs: **Karin Stein,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Ric Schleijpen,** TNO Defence, Security and Safety (Netherlands)

Programme Committee: **Joanne B. Culpepper,** Defence Science and Technology Group (Australia); **Willem H. Gunter,** Institute for Maritime Technology (South Africa); **Daniela H. Heinrich,** Norwegian Defence Research Establishment (Norway); **Maarten A. Hogervorst,** TNO (Netherlands); **Stacy E. Howington,** U.S. Army Engineer Research and Development Ctr. (United States); **Katrin Idla,** Tallinn Univ. of Technology (Estonia); **Hans M. Kariis,** Swedish Defence Research Agency (Sweden); **Luc Labarre,** ONERA (France); **Alexander Schwarz,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Peter Wellig,** Armasuisse (Switzerland)

MONDAY 5 SEPTEMBER

SESSION 1
LOCATION: PARIS . . . . MON 8:40 TO 10:10

Camouflage Assessment
Session Chair: **Karin Stein,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

8:40: **Demonstration of adaptive camouflage for the soldier** *(Invited Paper)*, Hans M. Kariis, FOI-Swedish Defence Research Agency (Sweden); Ana Barros, André Barbosa, Gilda Santos, CITEVE (Portugal); Patricia Ferreira, Damel Confecção de Vestuário, Ltd. (Portugal); Cecilia Gullström, FOI-Swedish Defence Research Agency (Sweden); Maarten A. Hogervorst, TNO (Netherlands); Rolf Jonsson, FOI-Swedish Defence Research Agency (Sweden); Celine Millet-Ribot, Safran (France); Vitalija Rubeziene, Ctr. for Physical Sciences and Technology (Lithuania); Alexander Schwarz, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Caroline Senzier, Safran (France); Sandra Varnaite-Žuravliova, State Scientific Research Institute Ctr. for Physical Sciences and Technology (Lithuania); Max E. Winkelmann, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Christina Åkerlind, FOI-Swedish Defence Research Agency (Sweden) . . . . [12270-1]

9:10: **Measuring the dynamics of camouflage in natural scenes using convolutional neural networks**, Erik Van der Burg, Maarten A. Hogervorst, Alexander Toet, TNO (Netherlands) . . . . [12270-2]

9:30: **A multitemporal hyperspectral camouflage detection and transparency experiment**, Wolfgang Gross, Simon Schreiner, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Marius Vögtli, Univ. Zürich (Switzerland); Florian Queck, Jannick Kuester, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Mathias Kneubühler, Univ. Zürich (Switzerland); Wolfgang Middelmann, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12270-3]

9:50: **Camouflage methods to counter artificial intelligence recognition**, Alexander Schwegmann, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12270-4]

Coffee Break. . . . . Mon 10:10 to 10:40

SESSION 2
LOCATION: PARIS . . . . MON 10:40 TO 12:50

Scenes and Background
Session Chair: **Ric H.M.A. Schleijpen,** TNO (Netherlands)

10:40: **A comparison of synthetic thermal imagery created using MuSES and thermal imagery captured in the field** *(Invited Paper)*, Jay Yu, Defence Science and Technology Group (Australia); Zohaib Khan, RMIT Univ. (Australia); Bin Lee, Defence Science and Technology Group (Australia) . . . . [12270-5]

11:10: **Validating colour representation in synthetic scenes using a virtual colour checker chart**, Qi Tao Shao, Thermovoltaic Technologies (Australia); Noel Richards, Deakin Univ. (Australia); Ryan Messina, Neal Winter, Joanne B. Culpepper, Defence Science and Technology Group (Australia) . . . . [12270-6]

11:30: **Hybrid simulation approaches to create realistic scenes for signature assessment**, Koen van der Sanden, Maarten A. Hogervorst, Piet Bijl, TNO (Netherlands) . . . . [12270-7]

11:50: **Local estimation of parametric point spread functions in thermal images via convolutional neural networks**, Florian Piras, Idiap Research Institute (Switzerland); Edouard De Moura Presa, Peter Wellig, Armasuisse (Switzerland); Michael Liebling, Idiap Research Institute (Switzerland) . . . . [12270-8]

12:10: **Determination of the cloud coverage using ground-based camera images in the visible and infrared spectral range**, Jeanette Mostafa, IPG Automotive GmbH (Germany) and Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Thomas Kociok, Erik Sucher, Karin Stein, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12270-9]

12:30: **Obtaining ground truth data in C-UAS trials**, Alexander Borghgraef, Fatma Ben Othmen, Marijke Vandewal, Royal Military Academy (Belgium) . . . . [12270-10]

Lunch Break . . . . Mon 12:50 to 14:10

SESSION 3
LOCATION: PARIS . . . . MON 14:10 TO 15:20

Material and Surface Properties
Session Chair: **Hans M. Kariis,** FOI-Swedish Defence Research Agency (Sweden)

14:10: **Adding graphene to low emissive paint** *(Invited Paper)*, Julia Elvirsson, Tomas Hallberg, Linda H. Karlsson, FOI-Swedish Defence Research Agency (Sweden) . . . . [12270-11]

15:00: **Optical studies of white biologically-inspired organic material surfaces for camouflage applications**, Christina Akerlind, Tomas Hallberg, FOI-Swedish Defence Research Agency (Sweden); Kenneth Järrendahl, Linköping Univ. (Sweden) . . . . [12270-12]

15:20: **Determination of the bidirectional texture function using a fiducial marker system**, Belinda Tepper, Bin Lee, Defence Science and Technology Group (Australia); Lijing Wang, RMIT Univ. (Australia) . . . . [12270-13]

Coffee Break. . . . . Mon 15:20 to 16:15

REMOTE SENSING PLENARY
LOCATION: CONVENTION HALL I-D . . . . .16:15 TO 18:00

16:15 to 16:30: **Welcome Address and Plenary Speaker Introduction**
Karsten Schulz, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

16:30: **The German environmental hyperspectral satellite EnMAP: mission update and related science activities** *(Plenary)*
Sabine I. Chabrillat, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ (Germany) and Leibniz Univ. Hannover (Germany)

17:15: **The space debris challenge: ESA's answer** *(Plenary)*
Holger Krag, European Space Operations Ctr. (Germany

CONFERENCE 12271

Tuesday 6 September 2022 • Proceedings of SPIE Vol. 12271

Electro-optical and Infrared Systems: Technology and Applications XIX

Conference Chairs: **Duncan L. Hickman,** Tektonex Ltd. (United Kingdom); **Helge Bürsing,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

Programme Committee: **Gianni Barani,** Leonardo (Italy); **Piet Bijl,** TNO Defence, Security and Safety (Netherlands); **Rainer Breiter,** AIM INFRAROT-MODULE GmbH (Germany); **Judith Dijk,** TNO Defence, Security and Safety (Netherlands); **Bernd Eberle,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Natan S. Kopeika,** Ben-Gurion Univ. of the Negev (Israel); **Robert A. Lamb,** SELEX ES (United Kingdom); **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); **Philip J. Soan,** Defence Science and Technology Lab. (United Kingdom)

TUESDAY 6 SEPTEMBER

SESSION 1

LOCATION: ESTREL HALL C5 . . . . TUE 8:50 TO 10:20

Sensors and Systems

Session Chair: **Duncan L. Hickman,** Tektonex Ltd. (United Kingdom)

8:50: **Narrow bandgap HgCdTe technology for IR sensing and imaging focal plane arrays** *(Invited Paper)*, Lorenzo Faraone, Wenwu Pan, Gilberto Umana-Membreno, Jarek Antoszewski, Wen Lei, Renjie Gu, Hemendra Kala, Nima Dehdashtiakhavan, Univ of Western Australia (Australia) . . . . . . [12271-1]

9:20: **Single-photon infrared waveguide-based upconversion imaging**, Ruaridh Smith, Fraunhofer Ctr. for Applied Photonics (United Kingdom) and Univ. of Glasgow (United Kingdom); Bienvenu I. Ndagano, Fraunhofer Ctr. for Applied Photonics (United Kingdom); Guillaume Redonnet-Brown, Amelia Weaver, BAE Systems (United Kingdom); Andy Astill, Covesion Ltd. (United Kingdom); Henry White, BAE Systems (United Kingdom); Corin Gawith, Covesion Ltd. (United Kingdom); Loyd J. McKnight, Fraunhofer Ctr. for Applied Photonics (United Kingdom) . . . . [12271-4]

9:40: **Electronic transport in infrared detector materials based on InAs/InGaSb type-II superlattices,** Gilberto A. Umana-Membreno, Nima Dehdashtiakhavan, Jarek Antoszewski, Lorenzo Faraone, The Univ. of Western Australia (Australia). . . . . [12271-24]

10:00: **Mid-infrared (LWIR) passive spectroscopic imaging with uncooled microbolometer array sensor (1st report): principle of imaging type two-dimensional Fourier spectroscopic imaging**, Ichiro Ishimaru, Tomoya Kitazaki, Yusuke Morimoto, So Yamashita, Daichi Anabuki, Shiori Tahara, Kenji Wada, Akira Nishiyama, Kagawa Univ. (Japan). . . . . [12271-2]

Coffee Break. . . . . .Tue 10:20 to 10:50

SESSION 2

LOCATION: ESTREL HALL C5 . . . . TUE 10:50 TO 12:10

Modelling and Simulation

Session Chair: **Duncan L. Hickman,** Tektonex Ltd. (United Kingdom)

10:50: **Modelling and simulation framework for ATR design evaluation**, Duncan L. Hickman, Tektonex Ltd. (United Kingdom); Eunjin Koh, Jaekyu Lee, Hyunjung Yoo, Baek Jeonghyun, Agency for Defense Development (Korea, Republic of). . . . . [12271-6]

11:10: **A scenario-based approach for the evaluation of video object tracking algorithm performance**, Yoldaş Ataseven, ASELSAN A.S. (Turkey) . . . . [12271-7]

11:30: **Modeling EO/IR systems with ASSET: sensor and noise model updates and validation**, Shannon R. Young, Air Force Institute of Technology (United States); Andrew Kondrath, Keaton Caudill, Radiance Technologies, Inc. (United States); Bryan J. Steward, Air Force Institute of Technology (United States) . . . . [12271-8]

11:50: **Modeling EO/IR systems with ASSET: applied machine learning for synthetic WFOV background signature generation**, Bret Wagner, Shannon R. Young, Kenneth Hopkinson, Bryan J Steward, Air Force Institute of Technology (United States) . . . . [12271-9]

Lunch/Exhibition Break . . . . Tue 12:10 to 13:30

SESSION 3

LOCATION: ESTREL HALL C5 . . . . TUE 13:30 TO 15:30

Technology in Germany

Session Chair: **Helge Bürsing,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13:30: **Field validation of a mobile detection system for laser scattering measurements in the NIR range**, Andreas Peckhaus, Fabian Elsässer, Thomas Hall, Frank Duschek, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . [12271-10]

13:50: **SIMTAD: a simulation tool for evaluating target detection performance of imaging systems** *(Invited Paper)*, Margarita An, Stefan Kessler, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . .[12271-11]

14:50: **Prototype measurement setup to assess near-eye display imaging quality: an update**, Christian Günther, Michael Henrichsen, Stefan Kessler, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12271-13]

15:10: **Microbolometer compatible metamaterial absorber for multispectral imaging**, Elahe Zakizade, Marvin Michel, Dirk Dittrich, Alexander Litke, Stefan Dreiner, Sascha Weyers, Fraunhofer-Institut für Mikroelektronische Schaltungen und Systeme IMS (Germany). . . . . [12271-14]

Coffee Break. . . . . .Tue 15:30 to 16:00

SESSION 4

LOCATION: ESTREL HALL C5 . . . . TUE 16:00 TO 17:20

Image and Data Processing

Session Chair: **Helge Bürsing,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

16:00: **Comparison of contrast enhancement algorithms based on TOD assessment by convolutional neural networks**, Daniel Wegner, Stefan Kessler, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12271-15]

16:20: **Distortion removal with deep learning in thermal images**, Ahmet Çapci, ASELSAN A.S. (Turkey); Hüseyin Emre Güven, Cognizen Inc. (Turkey); Behçet Uğur Töreyin, Istanbul Technical Univ. (Turkey). . . . [12271-16]

16:40: **Deep learning-based infrared image deblurring**, Huong Ninh, Chien Thai, Tran Tien Hai, Viettel Aerospace Institute (Vietnam) . . . . [12271-17]

17:00: **Maximum eigenvalue-based detection in fiber-optic distributed acoustic sensors applications**, Nagat Masued, Erkan Özkan, Tayfun Erkorkmaz, Samm Technology Communications Industry and Trade Inc. (Turkey) . . . . [12271-18]

POSTER SESSION
LOCATION: FOYER ESTREL SAAL ESTREL HALL . . . . 17:30 TO 19:00

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 AM–17:00 hrs

View poster presentation guidelines and set-up instructions at
https://spie.org/conferences-and-exhibitions/sensors-and-imaging/
presenters/prepare-to-present/poster-presentation-guidelines

**Mid-infrared (long-wave infrared) passive spectroscopic imaging with
an uncooled micro-bolometer array sensor (third report): background
correction using Planck's law as a basis function for general purposes
such as non-invasive blood glucose sensing and remote sensing**,
Shiori Tahara, Yusuke Morimoto, So Yamashita, Daichi Anabuki, Tomoya
Kitazaki, Akira Nishiyama, Kenji Wada, Ichiro Ishimaru, Kagawa Univ.
(Japan). . . . . [12271-20]

**Development and characterisation of a portable, active short-wave
infrared camera system for vision enhancement through smoke and fog**,
Matthias Mischung, Jendrik Schmidt, Enno Peters, Marco W, Berger,
Max Anders, Maurice Stephan, Deutsches Zentrum für Luft- und Raumfahrt
e.V. (Germany). . . . . [12271-12]

**Segmentation of electrical discharge processes based on the image
analysis of plasma-electrolyte oxidation**, Viacheslav V. Voronin,
Evgeny A. Semenishchev, Dmitry Chudinov, Olga Zhukova,
Sergey Zhukov, Moscow State Univ. of Technology "STANKIN" (Russian
Federation) . . . . [12271-21]

**Development of a fusion technique and an algorithm for merging
images recorded in the IR and visible spectrum in dust and fog**,
Evgeny A. Semenishchev, Viacheslav V. Voronin, Moscow State Univ of
Technology "STANKIN" (Russian Federation). . . . . [12271-22]

**Deep Visible and Thermal Image Fusion for Enhancement Visibility
for Surveillance Application**, Viacheslav Voronin, Marina Zhdanova,
Nikolay Gapon, Andrey Alepko, Alexander Zelensky, Moscow State Univ of
Technology (Russian Federation); Evgeny A. Semenishchev, Moscow State
Univ of Technology "STANKIN" (Russian Federation) . . . . [12271-23]

CONFERENCE 12272

Tuesday–Wednesday 6–7 September 2022 • Proceedings of SPIE Vol. 12272

Electro-Optical Remote Sensing XVI

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

Programme Committee: **Robert J. Grasso,** NASA Goddard Space Flight Ctr. (United States); **Laurent Hespel,** ONERA (France); **Martin Laurenzis,** Institut Franco-Allemand de Recherches de Saint-Louis (France); **Peter Lutzmann,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Kenneth J. McEwan,** Defence Science and Technology Lab. (United Kingdom); **Vasyl Molebny,** National Taras Shevchenko Univ. of Kyiv (Ukraine); **Gunnar Rustad,** Norwegian Defence Research Establishment (Norway); **Monte D. Turner,** Air Force Research Lab. (United States)

TUESDAY 6 SEPTEMBER

SESSION 1
LOCATION: ESTREL HALL C7 . . . . TUE 16:00 TO 17:20

Signal Processing and Modeling I
Session Chair: **Ove Steinvall,**
FOI-Swedish Defence Research Agency (Sweden)

16:00: **Tailoring hyperspectral background models to target detection problems**, Alan P. Schaum, U.S. Naval Research Lab. (United States) . . . . [12272-1]

16:20: **UAV-borne remote sensing for AI-assisted support of search and rescue missions**, Reinhold Herschel, Patrick Wallrath, Fraunhofer-Institut für Hochfrequenzphysik und Radartechnik FHR (Germany); Michael Hofstätter, Philip Taupe, AIT Austrian Institute of Technology GmbH (Austria); Martina Philippi, Ruhr-Univ. Bochum (Germany); Emily Krüger, Bundesanstalt Technisches Hilfswerk (THW) (Germany); Jan Rotter, Julian Kunze, Leibniz Univ. Hannover (Germany); Victoria Heusinger, Meral Ari, Fraunhofer-Institut für Kurzzeitdynamik, Ernst-Mach-Institut, EMI (Germany); René Kastner, Astrid Raschig, Disaster Competence Network Austria (Austria) . . . . [12272-2]

16:40: **Infrared saliency enhancement techniques for extended naval target detection in open sea scenario**, Osvaldo Pulpito, Univ. di Pisa (Italy) and Naval Support and Experimentation Ctr. (Italy); Sergio Ugo de Ceglie, Naval Support and Experimentation Ctr. (Italy); Nicola Acito, Univ. di Pisa (Italy); Marco Diani, Accademia Navale (Italy); Giovanni Corsini, Univ. di Pisa (Italy) . . . . [12272-3]

17:00: **Distributed acoustic sensing for fence monitoring: deep learning approach for detection and classification of events on various types of fence**, Billel Alla Eddine Bencharif, Tayfun Erkorkmaz, Samm Technologies (Turkey) . . . . [12272-4]

POSTER SESSION
LOCATION: FOYER ESTREL SAAL ESTREL HALL . . . . 17:30 TO 19:00

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Mobile fiber-optic Bragg sensor for monitoring axles of vehicles in urban traffic, Michael Fridrich, Marcel Fajkus, Michal Kostelanský, Jan Jargus, VŠB-Technical Univ. of Ostrava (Czech Republic) . . . . [12272-18]

Fiber-optic interferometric system for monitoring rail traffic, Michal Kostelanský, VŠB-Technical Univ. of Ostrava (Czech Republic) . . . . [12272-19]

Conceptual design for an ultrasensitive bioaerosol detection system, Julian Soltau, Arne Walter, Lea Fellner, Deutsches Zentrum für Luft- und Raumfahrt (Germany); Marian Kraus, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Karin M. Grünewald, Frank Duschek, Deutsches Zentrum für Luft- und Raumfahrt (Germany). . . . . [12272-20]

Noninvasive fibre optic Bragg sensor for rail vehicles monitoring implemented under the rail heel, Marcel Fajkus, Michal Kostelansky, Michael Fridrich, VŠB-Technical Univ. of Ostrava (Czech Republic) . [12272-21]

Measuring the pressure force by detecting the change in optical power intensity, Jan Jargus, Michal Kostelansky, Michael Fridrich, Marcel Fajkus, Jan Nedoma, VŠB-Technical Univ. of Ostrava (Czech Republic). . . . [12272-22]

Visualization of oscillatory stresses using adaptive photodetectors, Igor A. Sokolov, Mikhail A. Bryushinin, Ioffe Institute (Russian Federation) . . . . [12272-23]

WEDNESDAY 7 SEPTEMBER

SECURITY + DEFENCE PLENARY
LOCATION: CONVENTION HALL I-D . . . . 9:00 TO 10:40

9:00 to **Welcome Address and Plenary Speaker Introduction**
9:10: **Karin Stein,** Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

9:10: **Directed energy, the answer for the new threats** *(Plenary)*
Markus Jung, Rheinmetall Waffe Munition GmbH (Germany)

9:55: **SWIR and MWIR laser sources for optronics and directed energy** *(Plenary)*
Marc Eichhorn, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) and Karlsruhe Institute of Technology (Germany)

Coffee Break. . . . . Wed 10:40 to 11:00

SESSION 2
LOCATION: ESTREL HALL C7 . . . . WED 11:00 TO 12:30

Signal Processing and Modelling II
Session Chair: **Marcus Hammer,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

11:00: **Semantic segmentation of point clouds from scanning lidars** *(Invited Paper)*, Maria Axelsson, Max Holmberg, Michael Tulldahl, Swedish Defence Research Agency, FOI (Sweden). . . . . [12272-5]

11:30: **Geospecific terrain databases for military simulation environments**, Dirk Frommholz, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Frido Kuijper, TNO (Netherlands); Dimitri Bulatov, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Desmond Cheung, NLR - Royal Netherlands Aerospace Ctr. (Netherlands) . . . . [12272-7]

11:50: **Extraction and matching of 3D features for LiDAR-based self-localization in an urban environment**, Marcus Hammer, Marcus Hebel, Michael Arens, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany). . . . . [12272-8]

12:10: **Investigating sanitized and controlled image dataset to train deep convolutional neural networks for remote object detection on the field**, Alexander Pichler, Nicolas Hueber, Christophe Hennequin, Institut Franco-Allemand de Recherches de Saint-Louis (France) . . . . [12272-9]

Lunch/Exhibition Break . . . . Wed 12:30 to 14:00

SESSION 3

LOCATION: ESTREL HALL C7 . . . . **WED 14:00 TO 16:40**

Systems and Technology

Session Chair: **Peter Lutzmann,** Fraunhofer-Institut für Optronik,
Systemtechnik und Bildauswertung IOSB (Germany)

14:00: **Recent developments in airborne lidar bathymetry** *(Invited Paper)*,
Anders Ekelund, Airborne Hydrography AB (Sweden) . . . . [12272-10]

14:30: **Beam tracking and atmospheric influence on laser performance
in defeating UAVs**, Ove Steinvall, FOI-Swedish Defence Research Agency
(Sweden) . . . .[12272-11]

14:50: **Field trials of DIAL stand-off detection using CO_2 tunable
laser**, Michal Simko, SEC Technologies (Slovakia); Martin Valovsky, SEC
Technologies, s.r.o. (Slovakia) . . . . [12272-13]

Coffee Break. . . . . Wed 15:10 to 15:40

15:40: **Influence of turbulence on active compressive sensing imaging**,
Gabriela Paunescu, Peter Lutzmann, Daniel Wegner, Fraunhofer-Institut für
Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12272-14]

16:00: **Polarized dual single pixel imaging in SWIR**, Ludwig Hollmann,
David K. J. Gustafsson, Johan Eriksson, Carl Brännlund, FOI-Swedish
Defence Research Agency (Sweden) . . . . [12272-15]

16:20: **Application of an event-driven sensor to situational awareness**,
Marceau Bamond, Nicolas Hueber, Guillaume Strub, Sébastien Changey,
Institut Franco-Allemand de Recherches de Saint-Louis (France);
Jonathan Weber, Univ. de Haute Alsace (France). . . . . [12272-16]

CONFERENCE 12273

Tuesday–Wednesday 6–7 September 2022 • Proceedings of SPIE Vol. 12273

High-Power Lasers and Technologies for Optical Countermeasures

Conference Chairs: **David H. Titterton,** UK Defence Academy (United Kingdom); **Robert J. Grasso,** NASA Goddard Space Flight Ctr. (United States); **Harro Ackermann,** Joint Directed Energy Transition Office (United States); **Willy L. Bohn,** BohnLaser Consult (Germany); **Mark A. Richardson,** Cranfield Univ. (United Kingdom)

Programme 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); **Martin C. Richardson,** CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); **Bernd Eberle,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Jasbinder S. Sanghera,** U.S. Naval Research Lab. (United States); **Marc Eichhorn,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (France); **M. J. Daniel Esser,** Heriot-Watt Univ. (United Kingdom); **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. Schleijpen,** TNO Defence, Security and Safety (Netherlands); **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)

TUESDAY 6 SEPTEMBER

WELCOME AND INTRODUCTION: OPENING REMARKS
LOCATION: PARIS . . . . 13:40 TO 13:50

Robert J. Grasso, NASA Goddard Space Flight Ctr. (United States);
David H. Titterton, UK Defence Academy (United Kingdom)
Willy L. Bohn, BohnLaser Consult (Germany)

SESSION 1
LOCATION: PARIS . . . . TUE 13:50 TO 15:10

Modelling and Simulation
Session Chair: **Willy L. Bohn,** BohnLaser Consult (Germany)

13:50: **Stability and noise in frequency combs: efficient and accurate computation using dynamical Mmethods** *(Invited Paper)*, Curtis R. Menyuk, Shaokang Wang, Univ. of Maryland, Baltimore County (United States) . . . . [12273-1]

14:20: **Simulation of caustics caused by high-energy laser reflection from melting metallic targets adapted by a machine learning approach**, Adrian Azarian, Michael Henrichsen, Daniel Wegner, Gregor Franz, Bernd Eberle, Stefan Kessler, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12273-2]

14:40: **Modelling the behaviour of UAVs structural materials under continuous laser irradiations** *(Invited Paper)*, Vadim Allheily, Florent Retailleau, Théo Jean, Lionel Merlat, Institut Franco-Allemand de Recherches de Saint-Louis (France) . . . . [12273-3]

Coffee Break. . . . . Tue 15:10 to 15:40

SESSION 2
LOCATION: PARIS . . . . TUE 15:40 TO 17:00

Threats, Threat Detection and Threat Discrimination
Session Chair: **Robert J. Grasso,**
NASA Goddard Space Flight Ctr. (United States)

15:40: **Threat detection, identification and optical countermeasures for space-based applications**, Thorben Haarlammert, Axel Kwiatkowski, Max Möller, Frank Kröber, Uwe Schmidt, Simon Chelkowski, Jena-Optronik GmbH (Germany) . . . . [12273-5]

16:00: **Enhanced laser ranging for micro-UAV localization**, Juan S. Acosta, Ivo Buske, Andreas Walther, Daniel Fitz, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany) . . . . [12273-6]

16:20: **Smart GPS spoofing to countermeasure autonomously approaching agile micro UAVs**, Ivo Buske, Andreas Walther, Daniel Fitz, Juan S. Acosta, Andiy Konovaltsev, Lothar Kurz, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany). . . . . [12273-7]

16:40: **HELMA-P: a promising fiber laser-based low SWaP-C approach, cross-platform C-UAV laser capability**, David Sabourdy, Pierre Morin, Franck Maggi, Nicolas Marchet, Etienne Hartz, Robin Vincent, Maxime Courtin, Meryem AIT Moussa, CILAS (France) . . . . [12273-19]

PANEL DISCUSSION
LOCATION: PARIS . . . . .17:05 TO 17:45
Active vs Passive Threat Detection
Moderators: **Robert J. Grasso,**
NASA Goddard Space Flight Ctr. (United States)
David H. Titterton, UK Defence Academy (United Kingdom)

**Is it better/preferred to detect the threat pre-launch?
Or, is post-launch threat detection better/preferred?**

In most instances threats are detected post-launch. Hence, the IRCM system must respond to threat-warning sensors that a threat is approaching and effect countermeasures. Typically, passive threat-warning sensors detect launch and queues turret to slew to approaching threat and effect countermeasure. Essential is threat approaching before countermeasure effected. Given this crucial moment, is it better/preferred to detect threat before launch and effect countermeasure? This forum will discuss the implications of pre and post shot threat detection. Is threat detection pre-shot preferred? Or post-shot? Please join us for an insightful and meaningful discussion, but mostly to have a bit of fun.

WEDNESDAY 7 SEPTEMBER

SECURITY + DEFENCE PLENARY

LOCATION: CONVENTION HALL I-D . . . . **9:00 TO 10:40**

9:00 to **Welcome Address and Plenary Speaker Introduction**
9:10: **Karin Stein,** Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

9:10: **Directed energy, the answer for the new threats** *(Plenary)*
Markus Jung, Rheinmetall Waffe Munition GmbH (Germany)

9:55: **SWIR and MWIR laser sources for optronics and directed energy** *(Plenary)*
Marc Eichhorn, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) and Karlsruhe Institute of Technology (Germany)

Coffee Break. . . . . Wed 10:40 to 11:00

SESSION 3

LOCATION: PARIS . . . . **WED 11:00 TO 12:40**

Lasers and Sources

Session Chair: **Willy L. Bohn,** BohnLaser Consult (Germany)

11:00: **High-energy laser experiments for vulnerability studies in the context of the European TALOS program.** *(Invited Paper)*, Maximilian Taillandier, MBDA France (France). . . . . [12273-8]

11:30: **Analysis and manipulation of thermally induced modal instabilities in high-power fiber lasers** *(Invited Paper)*, Till Walbaum, Friedrich Möller, Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany); Friedrich Wilhelm Grimm, QS-GRIMM GmbH (Germany); Maximilian Strecker, Benjamin Yildiz, Stefan Kuhn, Nicoletta Haarlammert, Thomas Schreiber, Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany) . . . . [12273-9]

12:00: **Reflection measurements in TNO's 30 kW laser facility,** Denise Meuken, Sven A. Van Binsbergen V, Loes Scheers, Alexander M. J. van Eijk, Peter van den Berg, TNO (Netherlands). . . [12273-10]

12:20: **Large bandwidth lasers coherent beam combining in a 7-element YDFL array using a tailored SPGD algorithm,** Fabrizio Bisesto, Leonardo Company SpA (Italy); Alessandro Perna, Leonardo S.p.A. (Italy); Alberto Cosentino, Leonardo Company SpA (Italy); Francesco Coppola, Valentina Sacchieri, Leonardo S.p.A. (Italy) . . . . [12273-20]

Lunch/Exhibition Break . . . . Wed 12:40 to 13:40

SESSION 4

LOCATION: PARIS . . . . **WED 13:40 TO 15:10**

Quantum Cascade Lasers

Session Chair: **David H. Titterton,**
Cranfield Defence and Security (United Kingdom)

13:40: **High brightness, broad-area quantum cascade lasers emitting at ~4.0µm** *(Invited Paper)*, Arkadiy A. Lyakh, Enrique Cristobal, Luke Milbocker, Univ. of Central Florida (United States) . . . . [12273-11]

14:10: **Compact multi-watt QCL module** *(Invited Paper)*, Franz Münzhuber, Luisa Späth, Hans Dieter Tholl, Diehl Defence GmbH & Co. KG (Germany) . . . . [12273-12]

14:40: **Ruggedized-packaged, high-power mid-wave and long-wave infrared quantum cascade lasers** *(Invited Paper)*, Richard Maulini, Stéphane Blaser, Kaspar Suter, Antoine Müller, Alpes Lasers SA (Switzerland) [12273-13]

Coffee Break. . . . . Wed 15:10 to 15:30

SESSION 5

LOCATION: PARIS . . . . **WED 15:30 TO 16:00**

Optics and Optical Systems

Session Chair: **David H. Titterton,**
Cranfield Defence and Security (United Kingdom)

15:30: **Compact, diode end-pumped, eye-safe laser rangefinder transmitter** *(Invited Paper)*, Van Tuan Vu, Tuan Anh Nguyen, Manh Thang Tran, Bao Dong To, Viettel High Technology Industries Corp. (Vietnam). . . . . [12273-15]

SESSION 6

LOCATION: PARIS . . . . **WED 16:00 TO 17:40**

Laser Effects

Session Chair: **Ric H.M.A. Schleijpen,** TNO (Netherlands)

16:00: **The effectiveness of amplitude modulation on the laser dazzling of a mid-infrared imager** *(Invited Paper)*, Gareth D. Lewis, Marijke Vandewal, Robbie Struyve, Cedric Boeckx, Royal Military Academy (Belgium) . [12273-16]

16:30: **Laser damage experiments on fibre-reinforced plastic** *(Invited Paper)*, Matts Björck, Daniel Svedbrand, Lars Sjöqvist, FOI-Swedish Defence Research Agency (Sweden); Sten Edström, Defence Materiel Administration (Sweden) . . . . [12273-17]

17:00: **Numerical investigation of thermal effects of high-energy laser irradiation on a germanium lens,** Karel Desnijder, Royal Military Academy (Belgium); Marijke Vandewal, Royal Military Academy (Belgium). . . . [12273-18]

17:20: **Experimental investigation of high-power laser irradiation of missile materials in subsonic and supersonic flows,** Sebastian Schäffer, Fraunhofer-Institut für Kurzzeitdynamik, Ernst-Mach-Institut, EMI (Germany); Dirk Allofs, Patrick Gruhn, Ali Gülhan, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Martin Lueck, Jens Osterholz, Fraunhofer Ernst-Mach-Institut (Germany) . . . . [12273-21]

CONFERENCE 12274

Monday–Wednesday 5–7 September 2022 • Proceedings of SPIE Vol. 12274

Emerging Imaging and Sensing Technologies for Security and Defence VII

Conference Chairs: **Gerald S. Buller,** Heriot-Watt Univ. (United Kingdom); **Richard C. Hollins,** Defence Science and Technology Lab. (United Kingdom); **Robert A. Lamb,** Leonardo MW Ltd. (United Kingdom); **Martin Laurenzis,** Institut Franco-Allemand de Recherches de Saint-Louis (France)

Conference Co-Chairs: **Neil A. Salmon,** MMW Sensors Ltd. (United Kingdom); **Frank Gumbmann,** Rohde & Schwarz GmbH & Co. KG (Germany); **Roberto Zamboni,** Istituto per la Sintesi Organica e la Fotoreattività (Italy); **Chantal Andraud,** Ecole Normale Supérieure de Lyon (France); **Attila A. Szep,** Air Force Research Lab. (United States); **Paul M. Alsing,** Air Force Research Lab. (United States); **Michael L. Fanto,** Air Force Research Lab. (United States); **John G. Rarity,** Univ. of Bristol (United Kingdom); **Andrea Camposeo,** Istituto Nanoscienze, CNR (Italy); **Luana Persano,** Istituto Nanoscienze-CNR (Italy); **Lynda E. Busse,** U.S. Naval Research Lab. (United States); **Maria Farsari,** Foundation for Research and Technology-Hellas (Greece)

Programme Committee: **Giulia Acconcia,** Politecnico di Milano (Italy); **Gareth Brown,** Defence Science and Technology Lab. (United Kingdom); **Markus Henriksson,** FOI-Swedish Defence Research Agency (Sweden); **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 5 SEPTEMBER

SESSION 1
LOCATION: SAAL IV . . . . MON 8:30 TO 10:10

Single Photon Lidar
Session Chair: **Robert A. Lamb,** Leonardo MW Ltd. (United Kingdom)

SESSION 2
LOCATION: SAAL IV . . . . MON 10:40 TO 12:30

Single-Photon Imaging and Sensing
Session Chair: **Gerald S. Buller,** Heriot-Watt Univ. (United Kingdom)

SESSION 3
LOCATION: SAAL IV . . . . MON 13:50 TO 15:50

Single- and Low-Photon Detection
Session Chair: **Gerald S. Buller,** Heriot-Watt Univ. (United Kingdom)

REMOTE SENSING PLENARY

LOCATION: CONVENTION HALL I-D . . . .**16:15 TO 18:00**

16:15 to **Welcome Address and Plenary Speaker Introduction**
16:30: **Karsten Schulz,**Fraunhofer Institute of Optronics, System
Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

16:30: **The German environmental hyperspectral satellite
EnMAP: mission update and related science activities**
(Plenary)
Sabine I. Chabrillat, Helmholtz-Zentrum Potsdam Deutsches
GeoForschungsZentrum GFZ (Germany) and Leibniz Univ. Hannover
(Germany)

17:15: **The space debris challenge: ESA's answer** *(Plenary)*
Holger Krag, European Space Operations Ctr. (Germany

TUESDAY 6 SEPTEMBER

SESSION 4
LOCATION: SAAL IV . . . .**TUE 8:50 TO 10:00**

Computational Imaging
Session Chair: **Robert A. Lamb,** Leonardo MW Ltd. (United Kingdom)

8:50: **Comparison of compressive imaging and video techniques for
threat detection applications** *(Invited Paper)*, Jürgen Limbach, Christian
Eisele, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung
IOSB (Germany) . . . . [12274-15]

9:20: **Imaging enhancement using multifunctional subwavelength
structured windows**, Mane-Si Laure Lee, Raphaël Guillemet, Anne
Delboulbé, Doriane Jussey, Julie Cholet, Thales Research & Technology
(France); Caroline Arnoux, Akos Banyasz, Ecole Normale Supérieure de Lyon
(France); Fabian Hilbert, Multiphoton Optics GmbH (Germany);
Cyrille Monnereau, Patrice L. Baldeck, Ecole Normale Supérieure de
Lyon (France); Brigitte Loiseaux, Patrick Garabédian, Thales Research &
Technology (France); Pablo M. Romero, Aimen Ctr. de Aplicaciones Láser
(Spain) . . . . [12274-16]

9:40: **Visual homing guidance for projectiles using event-cameras**,
Marceau Bamond, Nicolas Hueber, Guillaume Strub, Sébastien Changey,
Institut Franco-Allemand de Recherches de Saint-Louis (France); Jonathan
Weber, Univ. de Haute Alsace (France) . . . . [12274-17]

Coffee Break. . . . . .Tue 10:00 to 10:30

SESSION 5
LOCATION: SAAL IV . . . .**TUE 10:30 TO 12:10**

Sensing Techniques
Session Chair: **Martin Laurenzis,** Institut Franco-Allemand de
Recherches de Saint-Louis (France)

10:30: **Sensing mechanical forces using plasmonically modulated
upconversion luminescence**, Bo Xu, Taleb Ba Tis, Cobi Sabo,
Eric N. Rappeport, Conrad Corbella Bagot, Wounjhang Park, Univ. of
Colorado Boulder (United States) . . . . [12274-18]

10:50: **Advances in metasurface-based mosaic filters for single-photon
detector arrays**, Peter Connolly, Heriot-Watt Univ. (United Kingdom); Yash
Shah, MetaHelios (United Kingdom); Jessica Valli, Heriot-Watt Univ. (United
Kingdom); Arran J Sykes, Heriot-Watt Univ. (United Kingdom); James Grant,
Claudio Accarino, University of Glasgow (United Kingdom); Yoann Altmann,
Colin Rickman, Heriot-Watt Univ. (United Kingdom); David R.S. Cumming,
University of Glasgow (United Kingdom); Gerald Buller, Heriot-Watt Univ.
(United Kingdom) . . . . [12274-19]

11:10: **Detection of threats concealed in opaque materials and containers
using a 18-26 GHz polarimetric radar**, Neil A. Salmon, MMW Sensors
Ltd. (United Kingdom); Eddie Blackhurst, The Univ. of Manchester (United
Kingdom). . . . . [12274-20]

11:30: **Next-generation of sUAS 360 surround vision cameras designed
for automated navigation in low-light conditions**, Patrice Roulet, Julie
Buquet, ImmerVision (Canada) . . . . [12274-21]

11:50: **Hybrid, reconfigurable Fresnel zone plate waveguides for ultracold
atoms**, Matthew Johnson, National Physical Lab. (United Kingdom); Anthony
Pike, Univ. of Strathclyde (United Kingdom); Victoria Henderson, Humboldt-
Univ. zu Berlin (Germany); Paul Griffin, Erling Riis, Aidan S. Arnold, Univ. of
Strathclyde (United Kingdom) . . . . [12274-22]

Lunch/Exhibition Break . . . . Tue 12:10 to 13:20

SESSION 6
LOCATION: SAAL IV . . . .**TUE 13:20 TO 16:20**

Quantum Technologies
Session Chair: **Gerald S. Buller,** Heriot-Watt Univ. (United Kingdom)

13:20: **Quantum lidar and mimic lidar** *(Invited Paper)*, John Jeffers,
Jonathan D. Pritchard, Richard Murchie, Hao yang, Nigam Samantaray,
Thomas Brougham, Mateusz Mrozowski, Univ of Strathclyde (United
Kingdom). . . . . [12274-54]

13:50: **GaN laser diodes for cold-atom quantum sensing, optical atomic
clocks and precision metrology**, Stephen P. Najda, Piotr Perlin, Tadek
Suski, Szymon Stanczyk, Ania Kafar, Michal Leszczynski, Dario Schiavon,
TopGaN Ltd. (Poland); Thomas J. Slight, Sivers Photonics Ltd. (United
Kingdom); Steffan Gwyn, Scott Watson, Anthony E. Kelly, Univ. of Glasgow
(United Kingdom); Martin Knapp, Mohsin Haji, National Physical Lab. (United
Kingdom). . . . . [12274-23]

14:10: **Electromagnetic imaging with atomic magnetometers:
applications in security and surveillance**, Ferruccio Renzoni, Univ. College
London (United Kingdom) . . . . [12274-24]

14:30: **Polarization effect on dressed plasmonic waveguides**,
Kosala Herath, Malin Premaratne, Monash Univ. (Australia) . . . . [12274-25]

14:50: **Modulation leakage vulnerability in continuous-variable quantum
key distribution**, Nitin Jain, Technical Univ. of Denmark (Denmark); Ivan D.
Derkach, Palacký Univ. Olomouc (Czech Republic); Hou-Man Chin, 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) . . . . [12274-26]

Coffee Break. . . . . Tue 15:10 to 15:40

15:40: **Optimization of continuous variables quantum key distribution
using discrete modulation**, Daniel Pereira, Nuno A. Silva, Margarida
Almeida, Armando N. Pinto, Instituto de Telecomunicações (Portugal) and
Univ. de Aveiro (Portugal). . . . . [12274-27]

16:00: **Impact of random polarization drift on a fiber-based continuous
variable quantum key distribution system**, Nuno A. Silva, Daniel Pereira,
Armando N. Pinto, Instituto de Telecomunicações (Portugal) and Univ. de
Aveiro (Portugal). . . . . [12274-28]

SESSION 7
LOCATION: SAAL IV . . . .**TUE 16:20 TO 17:20**

Millimetre Wave and Terahertz Sensors and Technology
Session Chairs: **Neil A. Salmon,**
MMW Sensors Ltd. (United Kingdom); **Frank Gumbmann,**
Rohde & Schwarz GmbH & Co. KG (Germany)

16:20: **Fully polarimetric UWB imaging demonstrator for group screening**,
Frank Gumbmann, Rohde & Schwarz GmbH & Co KG (Germany). . . [12274-29]

16:40: **The Terahertz-based nondestructive evaluation of military-
designated materials**, Martyna Strąg, Waldemar Swiderski, Military Institute
of Armament Technology (Poland) . . . . [12274-30]

17:00: **Porcine Skin as A Surrogate for Human Skin in Millimetre Wave
Sensing Research**, Amani Yousef Owda, Arab American Univ. (Palestine,
State of); Neil A. Salmon, MMW Sensors Ltd. (United Kingdom); Majdi Owda,
Arab American Univ. (Palestine, State of) . . . . [12274-31]

POSTER SESSION
LOCATION: FOYER ESTREL SAAL ESTREL HALL. . . . . **17:30 TO 19:00**

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 AM–17:00 hrs

View poster presentation guidelines and set-up instructions at
https://spie.org/conferences-and-exhibitions/sensors-and-imaging/
presenters/prepare-to-present/poster-presentation-guidelines

**Influence on the parameters of the optical resonator gyroscope of
the characteristics of the system with the properties of parity-time-
symmetry, which is used in it**, Yuri V. Filatov, Ekaterina A. Khorosheva,
Egor V. Shalymov, Saint Petersburg Electrotechnical Univ. (Russian
Federation); Anastasiya Venediktova, Faculty of Physics, St.-Petersburg State
University (Russian Federation); Vladimir Y. Venediktov, Saint Petersburg
Electrotechnical Univ. "LETI" (Russian Federation) . . . . [12274-41]

**Investigation of a ring confocal resonator sample designed to work as
an optical resonator gyroscope sensitive element**, Yuri V. Filatov, Saint
Petersburg Electrotechnical Univ. "LETI" (Russian Federation); Alexander S
Kukaev, Saint Petersburg Electrotechnical Univ. (Russian Federation); Egor
V. Shalymov, Vladimir Y. Venediktov, Saint Petersburg Electrotechnical Univ.
"LETI" (Russian Federation). . . . . [12274-42]

Investigation of the sensitivity of various configurations of fiber optic paths in the framework of determining the location of an intruder at a protected facility, Olga Y. Gubareva, Vladimir O. Gureev, Michael Dashkov, Povolzhskiy State Univ. of Telecommunications and Informatics (Russian Federation) . . . . [12274-43]

New image processing algorithm to control the accuracy of sharpening drills, Petr M. Pivkin, Moscow State Univ of Technology "STANKIN" (Russian Federation) . . . . [12274-45]

A new method for processing algorithm to recognition of the profile of micromills, Petr M. Pivkin, Moscow State Univ of Technology "STANKIN" (Russian Federation). . . . . [12274-46]

Algorithm for increasing the discriminability of sections of vortex structures and wind flows recorded by radio frequency stations using Doppler effect analysis, Evgeny A. Semenishchev, Viacheslav V. Voronin, Moscow State Univ of Technology "STANKIN" (Russian Federation) [12274-47]

FBG sensor encapsulated by using 3D printing technology for monitoring the heart rate of the human body, Michal Kostelanský, Michael Fridrich, Jan Jargus, VŠB-Technical Univ. of Ostrava (Czech Republic). . . . . [12274-48]

Development of nanotextured helical surfaces of end mills by grinding, electroerosion, laser ablation and additive technologies, Petr M. Pivkin, Moscow State Univ. of Technology "STANKIN" (Russian Federation) [12274-49]

Rapid implementation of GB-ArcSAR BP imaging algorithm, Yang Le, Chongqing Three Gorges University (China); Yunkai Deng, School of Information and Electronics, Beijing Institute of Technology (China); Zihao Lin, Beijing Institute of Technology (China) . . . . [12274-50]

New wavefront phase sensor used for 3D shape measurements of silicon wafers, Juan M Trujillo-Sevilla, Wooptix (Spain); Jan O. Gaudestad, Wooptix, S.L. (United States); Óscar Casanova-González, Alex Roqué-Velasco, Wooptix (Spain); Miguel Jesús Sicilia, Wooptix, S.L. (Spain); Jose Manuel Ramos-Rodríguez, Javier González Pardo, Wooptix (Spain) . . . . [12274-51]

Displacement optical sensor in two dimensions, Luigi Santamaria Amato, Agenzia Spaziale Italiana (Italy); Davide Bianco, Ctr. Italiano Ricerche Aerospaziali (Italy) . . . . [12274-55]

WEDNESDAY 7 SEPTEMBER

SECURITY + DEFENCE PLENARY

LOCATION: CONVENTION HALL I-D . . . . **9:00 TO 10:40**

9:00 to **Welcome Address and Plenary Speaker Introduction**
9:10: **Karin Stein,** Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

9:10: **Directed energy, the answer for the new threats** *(Plenary)*
Markus Jung, Rheinmetall Waffe Munition GmbH (Germany)

9:55: **SWIR and MWIR laser sources for optronics and directed energy** *(Plenary)*
Marc Eichhorn, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) and Karlsruhe Institute of Technology (Germany)

Coffee Break. . . . . Wed 10:40 to 11:00

SESSION 8
LOCATION: SAAL IV . . . . **WED 11:00 TO 12:50**

Advanced Manufacturing Technologies for Micro- and Nanosystems
Session Chairs: **Luana Persano,** Istituto Nanoscienze (Italy); **Andrea Camposeo,** Istituto Nanoscienze (Italy)

11:00: **Nanofibers based on polymers for energy harvesting and smart labels** *(Invited Paper)*, Luana Persano, Andrea Camposeo, Francesca Matino, Dario Pisignano, Istituto Nanoscienze (Italy). [12274-36]

11:30: **Nanoimprint-based subwavelength multifunctional optical windows: from visible to longwave infrared applications** *(Invited Paper)*, Raphaël Guillemet, Mane-Si Laure Lee, Julie Cholet, Doriane Jussey, Anne Delboulbé, Stéphane Xavier, Brigitte Loiseaux, Patrick Garabédian, Thales Research & Technology (France). . . . . [12274-33]

12:00: **New approaches in gas sensing using optical fibers** *(Invited Paper)*, Stavros Pissadakis, Foundation for Research and Technology-Hellas (Greece). . . . . [12274-34]

12:30: **The use of two-dimensional scales for measuring angle and linear displacement**, Yuri V. Filatov, Aleksander N. Korolev, Saint Petersburg Electrotechnical Univ. "LETI" (Russian Federation); Aleksander Y. Lukin, Peter the Great Saint-Petersburg Polytechnic Univ. (Russian Federation) . [12274-35]

Lunch/Exhibition Break . . . . Wed 12:50 to 14:00

SESSION 9
LOCATION: SAAL IV . . . . **WED 14:00 TO 16:40**

Optical Materials and Biomaterials Technology
Session Chairs: **Chantal Andraud,** Ecole Normale Supérieure de Lyon (France); **Roberto Zamboni,** Istituto per la Sintesi Organica e la Fotoreattività (Italy)

14:00: **Glial engineering and interfaces: biomaterials and device to dialogue with "the other brain"** *(Keynote Presentation)*, Valentina Benfenati, Istituto per la Sintesi Organica e la Fotoreattività (Italy). . . . . [12274-53]

14:40: **New high electromagnetic shielding effectiveness composite materials** *(Invited Paper)*, James G. Grote, SDXTEK - Software Defined Technologies, Inc. (United States); Michael M. Salour, SDXTek, Inc. (United States). . . . . [12274-52]

Coffee Break. . . . . Wed 15:10 to 15:30

15:30: **TBA** *(Invited Paper)* . . . . [12274-56]

16:00: **Toward white lasers: organic widely real-time tunable emitters**, Jaroslaw Mysliwiec, Martyna Durko-Maciag, Anna Popczyk, Alina Szukalska, Adam Szukalski, Wroclaw Univ. of Science and Technology (Poland); Yann Bretonniere, Lab. de Chimie, Ecole Normale Supérieure de Lyon (France); Chantal Andraud, Ecole Normale Supérieure de Lyon (France); Gilles Ulrich, Julien Massue, Institut de Chimie et Procédés pour l'Energie, l'Environnement et la Santé (France). . . . . [12274-37]

16:20: **Bacterial pathogen detection without amplification using a molecular probe-based biosensor in the magnetic field**, Maria Berezovskaya, Daria A. Gorbenko, ITMO Univ. (Russian Federation) [12274-40]

CONFERENCE 12275

Monday–Tuesday 5–6 September 2022 • Proceedings of SPIE Vol. 12275

Counterterrorism, Crime Fighting, Forensics, and Surveillance Technologies VI

Conference Chairs: **Henri Bouma,** TNO (Netherlands); **Radhakrishna Prabhu,** The Robert Gordon Univ. (United Kingdom); **Robert James Stokes,** Agilent Technologies (United Kingdom); **Yitzhak Yitzhaky,** Ben-Gurion Univ. of the Negev (Israel)

Programme Committee: **Maria Andersson,** FOI-Swedish Defence Research Agency (Sweden); **Stefan Becker,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Felicity Carlysle-Davies,** Univ. of Strathclyde (United Kingdom); **Brian E. Foulger,** Ministry of Defence (United Kingdom); **Gennadii E. Kotkovskii,** National Research Nuclear Univ. MEPhI (Russian Federation); **Gillian F. Marshall,** QinetiQ Ltd. (United Kingdom); **David Muench,** Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Niamh Nic Daeid,** Univ. of Dundee (United Kingdom); **Salman Rosenwaks,** Ben-Gurion Univ. of the Negev (Israel); **Andre Samberg,** i4-Flame OÜ (LLC) (Estonia); **Neil C. Shand,** Defence Science and Technology Lab. (United Kingdom); **Berkan Solmaz,** ASELSAN A.S. (Turkey); **Piotr Szynkarczyk,** Industrial Research Institute for Automation and Measurements (Poland); **Paul A. Thomas,** Defence Science and Technology Lab. (United Kingdom)

MONDAY 5 SEPTEMBER

SESSION 1
LOCATION: ESTREL HALL C8 . . . . **MON 9:10 TO 10:30**

CBRNE + Spectroscopy
Session Chairs: **Radhakrishna Prabhu,** The Robert Gordon Univ. (United Kingdom); **Robert James Stokes,** Agilent Technologies (United Kingdom)

9:10: **Use of dopants for detection of vapors of explosives by laser field asymmetric ion mobility spectrometer**, Gennadii E. Kotkovskii, Alexander A. Chistyakov, Vitaly A. Kostarev, Artem E. Akmalov, National Research Nuclear Univ. MEPhI (Russian Federation). . . . . [12275-1]

9:30: **Stationary two-unit detector of explosives with a light detector module based on traditional ion mobility spectrometry**, Gennadii E. Kotkovskii, Alexander A. Chistyakov, National Research Nuclear Univ. MEPhI (Russian Federation). . . . . [12275-2]

9:50: **Photostability of luminophores sensitive to vapors of nitroaromatic compounds in a porous silicon microcavity**, Tamara A. Kharinoeva, Igor L. Martynov, Evgenii V. Osipov, Gennadii E. Kotkovskii, Alexander A. Chistyakov, National Research Nuclear Univ. MEPhI (Russian Federation) . . . . . . [12275-3]

10:10: **UAV in the detection and assessment of the condition of injured persons**, Agnieszka Jenerowicz, Michal Kedzierski, Piotr Walczykowski, Wojskowa Akademia Techniczna im. Jaroslawa Dabrowskiego (Poland). . . . . [12275-4]

Coffee Break. . . . . Mon 10:30 to 11:00

SESSION 2
LOCATION: ESTREL HALL C8 . . . . **MON 11:00 TO 12:00**

Concealed, Remote Sensing, and Communication
Session Chairs: **Radhakrishna Prabhu; Robert James Stokes,** Agilent Technologies (United Kingdom)

11:00: **MMW imaging system based on GDD focal plane array with improved technology for detection of concealed objects**, Arun Ramachandra Kurup, Daniel Rozban, Lidor Kahana, Ariel Univ. (Israel); Natan S. Kopeika, Yitzhak Yitzhaky, Ben-Gurion Univ. of the Negev (Israel); Amir Abramovich Sr., Ariel Univ. (Israel) . . . . [12275-5]

11:20: **Detection and recognition of concealed faces using 340 GHz imaging system**, Ihsan Ozan Yildirim, Hakan Altan, Middle East Technical Univ. (Turkey); Asaf Behzat Sahin, Ankara Yildirim Beyazit Univ. (Turkey) . . . . [12275-6]

11:40: **A simulation into the physical and network layers of optical communication network for the subsea video surveillance of illicit activity**, Craig Stewart, Nazila Fough, Radhakrishna Prabhu, The Robert Gordon Univ. (United Kingdom). . . . . [12275-7]

Lunch Break . . . . Mon 12:00 to 13:30

SESSION 2
LOCATION: ESTREL HALL C8 . . . . **MON 13:30 TO 14:50**

Identity and Document Verification
Session Chairs: **Henri Bouma,** TNO (Netherlands); **Yitzhak Yitzhaky,** Ben-Gurion Univ. of the Negev (Israel)

13:30: **Speckle pattern analysis of security holograms and related foils for quality assessment and authentication**, Keerthy Krishnan S., Univ. of Kerala (India); Sajan Ambadiyil, Ctr. For Development of Imaging Technology (India); Avinash Kumar Jha, Independent Researcher (India); Radhakrishna Prabhu, The Robert Gordon Univ. (United Kingdom) . . . . [12275-8]

13:50: **Examination of fingerprint separation methods based on hyperspectral data measured from latent overlapping fingerprints**, Norimitsu Akiba, National Research Institute of Police Science (Japan); Atsushi Nakamura, Takayuki Sota, Waseda Univ. (Japan); Kazuhito Hibino, National Police Agency (Japan); Hidetoshi Kakuda, Ken'ichi Tsuchiya, Kosuke Tanabe, National Research Institute of Police Science (Japan) . . . . [12275-9]

14:10: **Combatting fraud on travel, identity and breeder documents**, Henri Bouma, Jelle van Mil, Johan-Martijn ten Hove, Raimon Pruim, Arthur van Rooijen, Alexander Kern, Luca Ballan, TNO (Netherlands); Ben Kromhout, Dominic Wolbers, Immigration and Naturalisation Service (Netherlands); Hans de Moel, Niels Dolstra, Gerton Bomhof, Demi de Rooij, Royal Netherlands Marechaussee (Netherlands) . . . . [12275-10]

14:30: **A cognitive camera system for increasing face recognition performance in backlit conditions**, Gökhan Koray Gültekin, Ankara Yildirim Beyazit Univ. (Turkey); Mustafa Ergul, ASELSAN S.A. (Turkey); Aycan Doğa Hakyemez, Afşar Saranlı, Aydın Alatan, Middle East Technical Univ. (Turkey); İhsan Emre Üstün, ASELSAN S.A. (Turkey). . . . . [12275-11]

Coffee Break. . . . . Mon 14:50 to 16:15

REMOTE SENSING PLENARY
LOCATION: CONVENTION HALL I-D . . . .**16:15 TO 18:00**

16:15 to 16:30: **Welcome Address and Plenary Speaker Introduction**
Karsten Schulz, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

16:30: **The German environmental hyperspectral satellite EnMAP: mission update and related science activities** *(Plenary)*
Sabine I. Chabrillat, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ (Germany) and Leibniz Univ. Hannover (Germany)

17:15: **The space debris challenge: ESA's answer** *(Plenary)*
Holger Krag, European Space Operations Ctr. (Germany

TUESDAY 6 SEPTEMBER

SESSION 4

LOCATION: ESTREL HALL C8 . . . .**TUE 9:00 TO 11:30**

AI-based Surveillance and Detection

Session Chairs: **Henri Bouma,** TNO (Netherlands);
Yitzhak Yitzhaky, Ben-Gurion Univ. of the Negev (Israel)

9:00: **Rapid person re-identification retraining strategy for flexible deployment in new environments**, Arthur van Rooijen, Henri Bouma, Jan Baan, Martin van Leeuwen, TNO (Netherlands). . . . . [12275-12]

9:20: **Federated tool for anonymization and annotation in image data**, Sabina van Rooij, Henri Bouma, Jelle van Mil, Johan-Martijn ten Hove, TNO (Netherlands) . . . . [12275-13]

9:40: **APMD: Adversarial Pixel Masking Derivative for Multispectral Object Detectors**, Jens Bayer, David Münch, Michael Arens, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) . . . . [12275-14]

Coffee Break. . . . . .Tue 10:00 to 10:30

10:30: **Real-time target classification and tracking by using outdoor PTZ cameras at the edge**, Enes Kavakli, Cevahir Çığla, Fikret Alim, ASELSAN A.S. (Turkey) . . . . [12275-15]

10:50: **Centralized tracking and bidirectional long short-term memory for abnormal behaviour recognition**, Maria Andersson, FOI-Swedish Defence Research Agency (Sweden). . . . . [12275-16]

11:10: **Using nonlinear activation functions to increase robustness of AI models to adversarial attacks**, Raz Birman, Itai Dror, Ofer Hadar, Ben-Gurion Univ. of the Negev (Israel) . . . . [12275-17]

POSTER SESSION

LOCATION: FOYER ESTREL SAAL ESTREL HALL. . . . . **17:30 TO 19:00**

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 AM–17:00 hrs

View poster presentation guidelines and set-up instructions at https://spie.org/conferences-and-exhibitions/sensors-and-imaging/ presenters/prepare-to-present/poster-presentation-guidelines

Detection of objects hidden behind various barriers using the THz radiovision method, Artem E. Akmalov, Gennadii E. Kotkovskii, Evgenii M. Maximov, Igor L. Martynov, Evgenii V. Osipov, Andrei A. Plekhanov, Yury A. Kuzishchin, Alexander A. Chistyakov, National Research Nuclear Univ. MEPhI (Russian Federation). . . . . [12275-19]

Block-based multiscale haze image enhancement method for remote sensing surveillance application, Viacheslav Voronin, Moscow State Univ. of Technology "STANKIN" (Russian Federation); Marina Zhdanova, Iliy Khamidullin, Olga Tokareva, Moscow State Univ. of Technology (Russian Federation); Alexander A. Zelensky, Evgeny A. Semenishchev, Moscow State Univ. of Technology "STANKIN" (Russian Federation) . . . . [12275-20]

Image enhancement based on Mmultiscale transform domain technique for visual surveillance application, Alexander Zelensky, Viacheslav Voronin, Moscow State Univ. of Technology "STANKIN" (Russian Federation); Nikolay Gapon, Moscow State Univ. of Technology (Russian Federation); Evgeny A. Semenishchev, Moscow State Univ. of Technology "STANKIN" (Russian Federation); Svetlana Voronina, Yu Ilyukhin, Moscow State Univ. of Technology (Russian Federation). . . . . [12275-21]

A Vision System Using Depth Inpainting for Virtual Content Reconstruction in Augmented Reality, Viacheslav Voronin, Nikolay Gapon, Moscow State Univ. of Technology "STANKIN" (Russian Federation); Iliy Khamidullin, Olga Tokareva, Moscow State Univ. of Technology (Russian Federation); Alexander Zelensky, Evgeny A. Semenishchev, Moscow State Univ. of Technology "STANKIN" (Russian Federation) . . . . [12275-22]

CONFERENCE 12276

Tuesday–Wednesday 6–7 September 2022 • Proceedings of SPIE Vol. 12276

Artificial Intelligence and Machine Learning in Defense Applications IV

Conference Chair: **Judith Dijk,** TNO Defence, Security and Safety (Netherlands)

Programme Committee: **Christopher R. Bell,** Defence Science and Technology Lab. (United Kingdom); **Fabrizio Berizzi,** European Defence Agency (Belgium); **David K.J. Gustafsson,** FOI-Swedish Defence Research Agency (Sweden); **Michel Honlet,** HENSOLDT Sensors GmbH (Germany); **Sidonie Lefebvre,** ONERA (France); **Andre Samberg,** i4-Flame OÜ (LLC) (Estonia); **Christopher J. Willis,** BAE Systems (United Kingdom)

TUESDAY 6 SEPTEMBER

SESSION 1
LOCATION: ESTREL HALL C8 . . . . .TUE 13:30 TO 14:30

Security Applications
Session Chair: **Judith Dijk,** TNO (Netherlands)

13:30: **Dynamic-automatic pipelines for finding topic-specific information clusters using NLP methods in connection with a model-driven approach**, Tobias Dorrn, Achim Kuwertz, Fraunhofer IOSB (Germany). . . . . [12276-23]

13:50: **A smart embedded imaging system for true color face analysis**, Ihsan Emre Üstün, ASELSAN A.S. (Turkey); Aziz Berkay Yesilyurt, Middle East Technical Univ. (Turkey); Mustafa Ergul, ASELSAN A.S. (Turkey); Aydin A. Alatan, Middle East Technical Univ. (Turkey); Öncel Erünver, ASELSAN A.S. (Turkey) . . . . [12276-2]

14:10: **Action Recognition Algorithm from Visual Sensor Data for Contactless Robot Control Systems**, Viacheslav Voronin, Marina Zhdanova, Moscow State Univ. of Technology "STANKIN" (Russian Federation); Ilia Khamidullin, Moscow State Univ. of Technology (Russian Federation); Evgeny A. Semenishchev, Alexander Zelensky, Moscow State Univ. of Technology "STANKIN" (Russian Federation); Yu. Ilyukhin, Moscow State Univ. of Technology (Russian Federation) . . . . [12276-3]

SESSION 2
LOCATION: ESTREL HALL C8 . . . . .TUE 14:30 TO 15:10

Annotation and Training
Session Chair: **Judith Dijk,** TNO (Netherlands)

14:30: **Automated example selection for iterative training of annotation networks**, Ugur Berk Sahin, Caglar Kavak, Yoldas Ataseven, ASELSAN A.S. (Turkey); Anıl Turker, ASELSAN Inc. (Turkey) . . . . [12276-4]

14:50: **Learning without gradients: multi-agent reinforcement learning approach to optimization**, Amir Morcos, U.S. Army Combat Capabilities Development Command (United States); Hong Man, Stevens Institute of Technology (United States); Brian Maguire, Aaron West, U.S. Army Combat Capabilities Development Command (United States) . . . . [12276-5]

SESSION 3
LOCATION: ESTREL HALL C8 . . . . .TUE 15:10 TO 15:30

Object Detection
Session Chair: **Judith Dijk,** TNO (Netherlands)

16:00: **CBAM-YOLOv5 for infrared image object detection**, Huong Ninh, Viet Pham Hoang, Cuong Le Ba, Tran Tien Hai, Bui Quang Minh, Viettel Aerospace Institute (Vietnam) . . . . [12276-8]

POSTER SESSION
LOCATION: FOYER ESTREL SAAL ESTREL HALL. . . . . 17:30 TO 19:00

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Video segmentation on Sstatic and dynamic textures ising a quaternion framework, Viacheslav Voronin, Marina Zhdanova, Moscow State Univ. of Technology "STANKIN" (Russian Federation); Aleksey Siryakov, Vladislav Egipko, Alexander Zelensky, Moscow State Univ. of Technology (Russian Federation); Evgeny A. Semenishchev, Moscow State Univ. of Technology "STANKIN" (Russian Federation). . . . . [12276-22]

Chinese sign language recognition based on multiview deep neural network for millimeter wave radar, Xing Wang, Chongqing Three Gorges Univ. (China); Chang Cui, Beijing Institute of Technology Chongqing Innovation Ctr. (China); Cong Li, Chongqing Three Gorges Univ. (China); XiChao Dong, Beijing Institute of Technology (China) . . . . [12276-26]

WEDNESDAY 7 SEPTEMBER

SECURITY + DEFENCE PLENARY
LOCATION: CONVENTION HALL I-D . . . . 9:00 TO 10:40

9:00 to **Welcome Address and Plenary Speaker Introduction**
9:10: **Karin Stein,** Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)
2022 Remote Sensing Chair

9:10: **Directed energy, the answer for the new threats** *(Plenary)*
Markus Jung, Rheinmetall Waffe Munition GmbH (Germany)

9:55: **SWIR and MWIR laser sources for optronics and directed energy** *(Plenary)*
Marc Eichhorn, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) and Karlsruhe Institute of Technology (Germany)

Coffee Break. . . . . Wed 10:40 to 11:00

SESSION 4

LOCATION: ESTREL HALL C8 . . . . **WED 11:00 TO 13:20**

Evaluation of AI Systems

Session Chair: **Judith Dijk,** TNO (Netherlands)

11:00: **Meaningful machine learning robustness evaluation in real-world machine learning enabled system contexts** *(Invited Paper)*, Ben Hiett, Peter Boyd, Charles Fletcher, Sam Gowland, James Sharp, Defence Science and Technology Lab. (United Kingdom); David R. Slogget, Univ. of Oxford (United Kingdom); Alec Banks, Defence Science and Technology Lab. (United Kingdom). . . . . [12276-10]

11:30: **Evaluating active learning methods for synthetic aperture radar maritime object detection**, Jonathan Sato, Julian Raheema, Martin Jaszewski, Naval Information Warfare Ctr. Pacific (United States) . . [12276-11]

11:50: **Performance metrics with operational context for video object detection algorithms**, Yoldas Ataseven, ASELSAN A.S. (Turkey) . . [12276-12]

12:10: **Comparative evaluations of online and offline visual tracking algorithms**, Ozan Yardimci, Roketsan Roket Sanayii ve Ticaret A.S. (Turkey) . . . . [12276-13]

12:30: **ARORA & NavSim: a simulator system for training autonomous agents with geospecific data**, Armando Fandango, Alexander Gutierrez, University of Central Florida (United States); Clive Hoayun, Univ. of Central Florida (United States); Jonathan Hurter, Dean Reed, University of Central Florida (United States) . . . . [12276-25]

12:50: **Seascape: a due-diligence framework for algorithm acquisition** *(Invited Paper)*, Christopher Pitts, Emily R. Moore, Forest Danford, William Marchetto, Henry Qiu, Leon C. Ross, Todd A. Pitts, Sandia National Labs. (United States) . . . . [12276-14]

Lunch/Exhibition Break . . . . Wed 13:20 to 14:30

SESSION 5

LOCATION: ESTREL HALL C8 . . . . **WED 14:30 TO 15:30**

Aerial Imaging

Session Chair: **Judith Dijk,** TNO (Netherlands)

14:30: **Automatic bomb crater detection and localization based on historical aerial imagery**, Matthias P. Wagner, Panopterra UG (Germany); Marcel König, Private Consultant (Germany); Alireza Taravat, Deimos Space UK Ltd. (United Kingdom) . . . . [12276-15]

14:50: **Masking selected fragments of satellite images with the use of generative neural networks**, Kinga Karwowska, Agnieszka Jenerowicz, Damian Wierzbicki, Wojskowa Akademia Techniczna im. Jaroslawa Dabrowskiego (Poland) . . . . [12276-17]

15:10: **Hybrid feature extraction based on PCA and CNN for oil rig classification in C-Band SAR imagery**, Fabiano G. da Silva, Lucas P. Ramos, Instituto Tecnológico de Aeronáutica (Brazil); Bruna G. Palm, Instituto Tecnológico de Aeronáutica (Brazil) and Blekinge Institute of Technology (Sweden); Dimas I. Alves, Instituto Tecnológico de Aeronáutica (Brazil); Mats I. Pettersson, Blekinge Institute of Technology (Sweden); Renato J. Machado, Instituto Tecnológico de Aeronáutica (Brazil) . . [12276-18]

Coffee Break. . . . . Wed 15:30 to 16:00

SESSION 6

LOCATION: ESTREL HALL C8 . . . . **WED 16:00 TO 17:00**

Aerial Object Detection

Session Chair: **Judith Dijk,** TNO (Netherlands)

16:00: **Multispectral optical signatures of micro UAV: acquisition and database for usage in a neural network**, Daniel Fitz, Ivo Buske, Andreas Walther, Juan Acosta, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany). . . . . [12276-19]

16:20: **Bandwidth constrained cooperative object detection in images**, Diego Marez, Lena Nans, Samuel T. Borden, Naval Information Warfare Ctr. Pacific (United States) . . . . [12276-20]

16:40: **Machine learning for image reconnaissance: automatic aircraft detection and identification**, Agnieszka Jenerowicz, Damian Wierzbicki, Kinga Karwowska, Wojskowa Akademia Techniczna im. Jaroslawa Dabrowskiego (Poland) . . . . [12276-21]
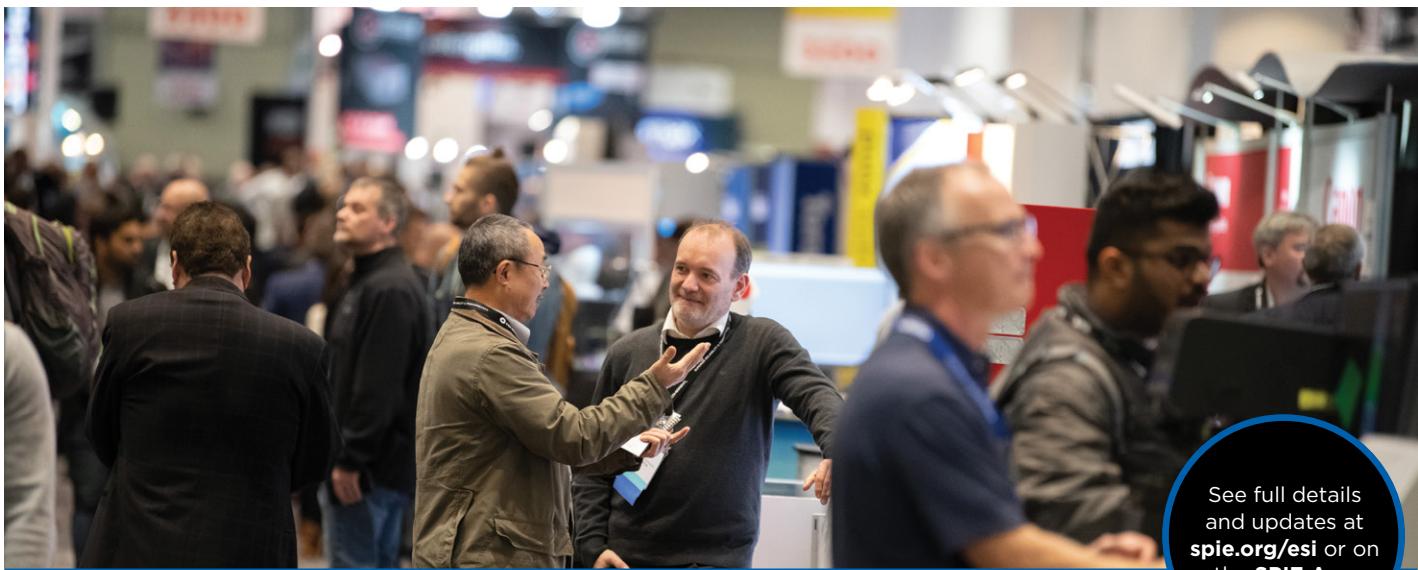
Exhibitor Directory

SPIE. SENSORS+ IMAGING

Estrel Congress Center

Tuesday 5 September 10:00–17:00
Wednesday 6 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.

See full details and updates at **spie.org/esi** or on the **SPIE App**
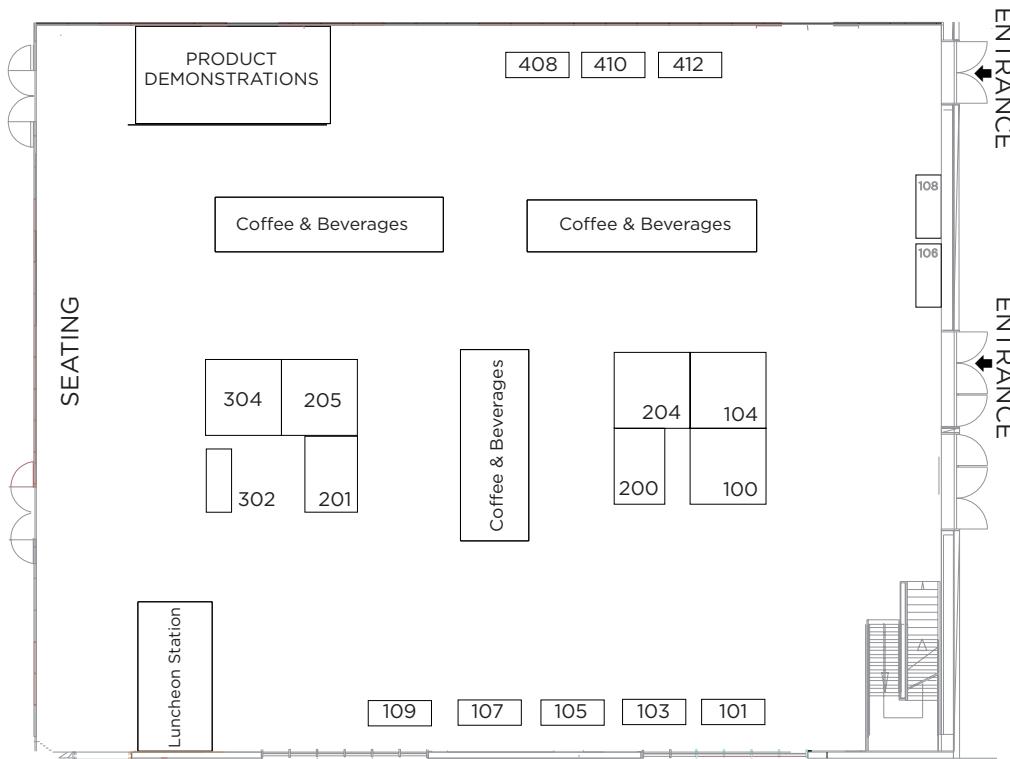
BOOTH #	EXHIBITOR
100	Hellma Materials
101	eagleyard Photonics GmbH/TOPTICA eagle-yard
103	SphereOptics GmbH
104	SI IMAGING SERVICES
105	Laser 2000
105	Resonon Inc.
106	Cranfield Defence and Security
107	OptoSigma Europe S.A.S.
108	ALPAO
109	Photon Force Ltd.
200	CAILabs
201	Sandvik Osprey Ltd
204	FiberBridge Photonics GmbH
205	HGH Infrared Systems
302	optics.org
304	PowerPhotonic Ltd.
408	Caeleste CVBA
410	HOLOEYE Photonics AG
412	Argotech a.s.

EXHIBITOR LISTING

ALPAO #108
SPIE. CORPORATE MEMBER

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Caeleste CVBA #408
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Cranfield Defence and Security #106
Cranfield Univ Shrivenham, Swindon Wiltshire, SN6 8LA
United Kingdom
+44 1793 785810; fax +44 1793 783878
enquiries@cranfield.ac.uk; www.cranfield.ac.uk/cds/

eagleyard Photonics GmbH/ TOPTICA eagleyard #101
SPIE. CORPORATE MEMBER

Rudower Chaussee 29, Berlin, 12489 Germany
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info@toptica-eagleyard.com; www.toptica-eagleyard.com

Featured Product: Laser Diodes for (Quantum) sensing, oxygen detection, intersattelite communication, defense

TOPTICA eagleyard's' core competence is the development, production and sale of innovative high-power laser diodes based on GaAs (Gallium Arsenide). Its portfolio contains laser diodes with wavelengths ranging from 630 nm to 1120 nm sorted in five product families: Single Mode Laser Diodes, Single Frequency Laser Diodes, Multimode Laser Diodes, Tapered Amplifiers and Gain Chips. For more information, please visit our website: https://www.toptica-eagleyard.com Contact: Michael Kneier, VP Sales & Marketing, info@toptica-eagleyard.com; Stephanie Hannibal, Marketing Communication Manager, stephanie.hannibal@toptica-eagleyard.com

FiberBridge Photonics GmbH #204
SPIE. CORPORATE MEMBER

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

Featured Product: High-Power Fiber Arrays, High-Power Fiber Components, Spliceless Fiber Amplifier Modules

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 Contact: Jörn Tolkien, Business Development Manager, j.tolkien@fb-photonics.com; Thomas Theeg, CEO, info@fb-photonics.com

Hellma Materials #100
Moritz-von-Rohr-Str 1, Jena, 07745 Germany
+49 3641 28770; fax +49 3641 2877 200
info.materials@hellma.com; www.hellma-materials.com

Featured Product: CaF2 Calcium Fluoride, BaF2 Barium Fluoride, ZnS Zinc Sulfide, Cleartran, ZnSe Zinc Selenide

Hellma Materials GmbH and its subsidiaries IV IR Optics Gmbh and CVD Ceramics, Inc. are leading manufacturers of high quality optical materials including CaF2, BaF2, Germanium, ZnS, Cleartran, ZnSe. These optical materials cover the full wavelength range from deep UV, VIS up to IR enabling a wide variety of applications like microlithography, laser optics, microscopy, astronomical instrumentation, thermal imaging, night vision systems and more. Contact: Christian Stuhldreher, Area Sales Manager - North America + Europe, Christian.Stuihldreher@Hellma.com

HGH Infrared Systems #205
10 rue Maryse Bastié, Igny, 91430 France
+33 1 69 35 47 70; fax +33 1 69 35 47 80
hgh@hgh.fr; www.hgh-infrared.com

Featured Product: BIRD210 bench with ultra low noise electronics and multiple functions for testing detectors

HGH provides leading-edge electro-optical test solutions: blackbodies, visible to SWIR sources, high-performance collimators, customized test benches for cameras, detectors and other EO systems figures among the sharp expertise HGH offers to universities, research labs, EO systems manufacturers and test centers. At SPIE Sensors + Imaging 2022, HGH will showcase the modular BIRD210 system for testing CMOS detectors with ultra low noise electronics and multiple testing functions. Contact: Jean Menguy, Test & Measurement Sales Engineer, jean.menguy@hgh-infrared.com; Catherine Barrat, Test & Measurement Sales Manager, catherine.barrat@hgh-infrared.com

HOLOEYE Photonics AG #410
SPIE. CORPORATE MEMBER

Volmerstr. 1, Berlin, 12489 Germany
+49 30 4036 9380; fax +49 30 4036 938 99
contact@holoeye.com; https://www.holoeye.com

Featured Product: Fast Spatial Light Modulators capable of color sequential phase operation, 3x8 bit in a frame (180Hz)

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Laser 2000   #105

Argelsrieder Feld 14, Wessling, 82234 Germany
+49 8153 405 0; fax +49 8153 405 33
info@laser2000.de; www.laser2000.de

Featured Product: Hyperspectral imaging is the cutting-edge technology for detection, recognition and identification.

For over 35 years, Laser 2000 has been providing innovative photonics, machine vision and fiber optics solutions to meet the most demanding applications. Together with the world's leading companies, we respond to every special requirement and deliver customized solutions from a single source. We are avid promoters of optical technologies and are always at the cutting edge of development, products and application options. Contact: Martin Labus, Sales Engineer, m.labus@laser2000.de; Karl Cichon, Sales Engineer, k.cichon@laser2000.de

PROMOTIONAL PARTNER

optics.org   #302

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OptoSigma Europe S.A.S.   #107

SPIE. CORPORATE MEMBER

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Photon Force Ltd.   #109

SPIE. CORPORATE MEMBER

Murchison House, 10 Max Born Crescent, Edinburgh,
EH9 3BF United Kingdom
+44 1316517944
enquiries@photon-force.com; www.photon-force.com

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 biomedical research, 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. Contact: Robbie Thomas

PowerPhotonic Ltd.   #304

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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.

Resonon Inc.   #105

123 Commercial Dr, Bozeman, MT, 59715-2217 United States
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Resonon,Inc. provides hyperspectral imagers and complete turn-key systems. Our imagers are noted for their excellent imaging and data quality. Our SpectrononPro software package is the most robust in the industry, making calibration, data collection, visualization, and analysis easy for all users. A complete suite of Hyperspectral Vegetation Indices (HVI's), classification algorithms, analytical tools, and the most popular hyperspectral data utilities, are available with the click of a mouse. With scientific-grade data and industrial ruggedness, Resonon systems are ideal for machine vision applications.

Sandvik Osprey Ltd   #201

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+44 1639 634121; fax +44 1639 630100
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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

SI IMAGING SERVICES   #104

169-84 Gwahak-ro, Yuseong-gu, 34133 Korea, Republic of
+82 42 341 0051
publicrelations@si-imaging.com; www.si-imaging.com

Featured Product: KOMPSAT Satellite Imagery

We are the sales representative of KOMPSAT (Korean Multi-Purpose Satellite) series 2, 3, 3A, and 5. We contribute to the remote sensing and earth observation industries by supplying VHR optical and SAR satellite imagery through 160 partners worldwide. Customers from industries and governments use KOMPSAT imagery for their missions and research, such as defense, disaster monitoring, mapping, urban planning, agriculture, etc. We plan to launch our own 30cm VVHR EO satellite, SpaceEye-T, in 2024. Contact: Minji Lee, Manager, publicrelations@si-imaging.com

SphereOptics GmbH   #103

Gewerbestr 13, Herrsching, 82211 Germany
+49 8152 983 78 90; fax +49 8152 983 78 91
info@sphereoptics.de; www.sphereoptics.de/en/

Since our formation in 2003, our technical experts are always standing-by when it comes to discussing standard or customer specific solutions in the areas of lighting technology, optical measurement service and remote sensing (industrial Infrared cameras, hyperspectral cameras for remote sensing applications in the spectral range 0,25 μm to 15 μm). In addition, we offer Photonic workshops and seminars. SphereOptics is ISO 9001 certified and ISO 17025 accredited for reflectance calibration.

PRODUCT DEMONSTRATIONS

Convention Hall 1 – Hall C

Watch in-person overviews of the latest products and processes from Sensors + Imaging exhibitors

Tuesday 6 September

10:30–11:00
HGH Infrared Systems
Presenter: **Catherine Barrat**

Infinity focusing of objective on cameras made easy through the MTF Live function of Infratest
Testing EO systems requires ergonomic tools and procedures, especially in the context of production. The infinity focusing of a camera is demonstrated through our easy-to-use and accurate MTF function

11:30–12:00
ALPAO
Presenter: **Piero BRUNO**

ALPAO's adaptive optics products range
Discover our large and specific range of adaptive products: deformable mirrors, wavefront sensors and control systems.

12:30–13:00
Caeleste cvba
Presenter: **Jan Vermeiren**
Versatile image sensors for the Space 4.0 era

With our own RHbD IP library, we design imagers for space 4.0 in a short time reducing system cost. Stitched designs can create many imager formats in very short time. We will discuss several devices.

13:30–14:00
SI Imaging Service
Presenter: **Moongyu Kim**

Korean space programs towards virtual VVHR constellation
SI Imaging Services is the sales representative of KOMPSAT (Korean Multi-Purpose Satellite) series 2, 3, 3A, and 5. We plan to launch our own 30 cm VVHR EO satellite, SpaceEye-T, in 2024.

Wednesday 7 September

11:30–12:00
PowerPhotonic Ltd.
Presenter: **Mark Wilson**

Beam Shaping to improve laser performance
Discover our range of beam shaping optics for both single mode and multimode beams. Each one is designed to enhance and improve your laser systems performance.

13:30–14:00
OptoSigma Europe
Presenter: **Axel Haunholter**

New photonic applications lead to new types of materials with higher tolerances
We are presenting polishing at angstrom level of glass substrates and the benefit of using of SiC material for photonic applications.

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GENERAL INFORMATION

Conference + Exhibition Registration
Rotunda

Exhibition-only visitor registration is complimentary, but you still must register.

Sunday 4 September	15:00 - 18:00
Monday 5 September	07:30 - 17:00
Tuesday 6 September	08:00 - 17:00
Wednesday 7 September	08:30 - 16:00

SPIE Cashier
Registration Area. Open during registration hours.
Registration payments

If you are paying by cash or check as part of your onsite registration, and wish to add a special event requiring payment, or have questions regarding your registration, visit the SPIE Cashier.

Receipt and Certificate of Attendance
Preregistered attendees who did not receive a receipt, or attendees who need a Certificate of Attendance may obtain those from the SPIE Cashier.

Badge corrections
Badge corrections can be made at the Badge Corrections station. Please have your badge removed from the badge holder and marked with your changes before approaching the counter.

Refund Information
There is a €50 ($50 US) service charge for processing refunds. Requests for refunds must be received by 25 August 2022; all registration fees will be forfeited after this date. Membership dues, SPIE Digital Library subscriptions or Special Events purchased are not refundable.

Press registration
• For credentialed press and media representatives only; see our press registration page for SPIE policy.

• Please email contact information, title, and organization to media@spie.org.

SPIE Member, SPIE student Member + Student Pricing
• SPIE Members receive conference registration discounts. Discounts are applied at the time of registration.

• Student registration rates are available only to undergraduate and graduate students who are enrolled full time and have not yet received their Ph.D. Post-docs may not register as students. A student ID number or proof of student status is required with your registration.

Speaker Preview Station
Room Lyon

Monday through Wednesday 07:00–17:00

All conference rooms have a computer workstation, projector, screen, lapel microphone, and laser pointer.

All presenters are requested to come to Speaker Preview with their memory devices or laptops to confirm their presentation display settings and upload their presentation.

Poster setup instructions
ESTREL Room Foyer

Tuesday Poster Session: 17:30–19:00

Poster Setup: Tuesday 10:00–17:00

Each poster presenter is provided a space 0.98 wide x 1.30m high in which to display a summary of the paper (The board will accommodate AO size poster in portrait orientation.) Poster presenters will stand by their posters to answer questions.

Poster presenters who are not set up at the beginning of the session will be considered a "no show" and their manuscript will not be published.

Posters must be removed at the end of the poster session since the poster boards will then be removed and the remaining posters discarded. SPIE assumes no responsibility for posters left up after the end of the poster session.

Wireless Internet
Complimentary wireless access is available; instructions will be posted onsite.

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 here.

Business Centre

There is no business centre at the venue, but the ESTREL has a facility to print boarding passes in the Foyer. All other services can be obtained from a nearby Copyshop, "Copycania", based in Innstrasse 31, 12045 Berlin.

SPIE luggage and coat check
Near the registration desk

Monday through Wednesday 08:00–18:00

Luggage, package, and coat storage at 1 EU per piece are available. Please note hours; no late pickup available.

Urgent Message Line

An urgent message line is available during registration hours: +44 29 2089 4747

Food and beverage services

Coffee Breaks
Complimentary coffee will be available throughout the day, In addition, coffee breaks are scheduled at 10:00 and 15:00 hrs. Check individual conference listings for exact locations.

Food and refreshments for purchase
Convention Hall I C

Hot and cold snacks, hot entrees, deli sandwiches, salads, and pastries are available for purchase. Cash and credit cards accepted. The ESTREL Hotel Main Foyer also offers a number of restaurants.

Acceptance of Policies and Registration Conditions

The following policies and conditions apply to all SPIE events, both online and in person. As a condition of registration, you will be required to acknowledge and accept the SPIE policies and conditions contained herein.

SPIE has established a confidential reporting system for all SPIE event participants to raise concerns about possible unethical or inappropriate behavior within our community. When at an SPIE event, you may contact any SPIE staff with concerns. If you feel that you are in immediate danger, please dial the local emergency number for police intervention.

Agreement to hold harmless

Attendee agrees to release and hold harmless SPIE from any and all claims, demands, and causes of action arising out of or relating to your participation in the event you are registering to participate in and use of any associated facilities or hotels.

Be well agreement

Any public space where other people are present holds an inherent risk of exposure to COVID-19 and other communicable diseases. By attending this event, I agree to voluntarily assume all risk related to exposure and agree to not hold SPIE or any of their affiliates including partners and sponsors, directors, officers, employees, agents, contractors, volunteers, or sponsored venues liable for illness. I will take necessary precautions while at the event including, but not limited to, engaging in appropriate social distancing, wearing a mask in public areas when not consuming food or beverage if required, minimizing face touching, frequently washing hands, and avoiding risky environments such as overcrowded bars or restaurants. I agree to not attend any SPIE event if I feel ill or had recent exposure to a COVID-19 case.

Anti-harassment policy

It is SPIE policy that all employees, volunteers, and participants are entitled to respectful treatment. Any form of bullying, discrimination, harassment, sexual or otherwise, is unacceptable and will not be tolerated. This policy applies to all locations and situations where SPIE business is conducted and to all SPIE-sponsored activities and events.

Read complete policy

Attendee registration and admission policies

SPIE, or their officially designated event management, in their sole discretion, reserves the right to accept or decline an individual's registration for an event. Further, SPIE, or event management, reserves the right to prohibit entry of or to remove any individual whether registered or not, be they attendees, exhibitors, representatives, or vendors, whose conduct is not in keeping with the character and purpose of the event. Without limiting the foregoing, SPIE and event management reserve the right to remove or refuse entry to anyone who has registered or gained access under false pretenses, provided false information, or for any other reason whatsoever that they deem is cause under the circumstances.

Capture and use of a person's image

By registering for an SPIE event, you grant full permission to SPIE to capture, store, use, and/or reproduce your image or likeness, including incidental capture of any individuals in your household or workplace, by any audio and/or visual recording technique and create derivative works of these images and recordings in any SPIE media now known or later developed, for any legitimate SPIE purpose. By registering for an SPIE event, you waive any right to inspect or approve the use of the images or recordings or of any written copy. You also waive any right to royalties or other compensation arising from or related to the use of the images, recordings, or materials. By registering, you release, defend, indemnify, and hold harmless SPIE from and against any claims, damages, or liability arising from or related to the use of the images, recordings or materials, including but not limited to claims of defamation, invasion of privacy, or rights of publicity or copyright infringement, or any misuse, distortion, blurring, alteration, optical illusion, or use in composite form that may occur or be produced in taking, processing, reduction, or production of the finished product, its publication or distribution.

Code of conduct

SPIE is committed to providing a harassment- and discrimination-free experience for everyone at our events, an experience that embraces the richness of diversity where participants may exchange ideas, learn, network, and socialize in the company of colleagues in an environment of mutual respect.

Read complete code

Event cancellation policy

If for some unforeseen reason SPIE should have to cancel an event, processed registration fees will be refunded to registrants. Registrants will be responsible for cancellation of travel arrangements or housing reservations and the applicable fees.

Family-friendly policy

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.

Laser-pointer safety policy

SPIE supplies tested and safety-approved laser pointers for all conference meeting rooms. For safety reasons, SPIE requests that presenters use provided laser pointers. Use of a personal laser pointer represents the user's acceptance of liability for use of a non-SPIE-supplied laser pointer. If you choose to use your own laser pointer, you must have it tested at speaker check-in.

No smoking policy

Attendees will observe all non-smoking regulations that are publicly posted by the facilities used by the event.

Online commenting policy

SPIE moderates all comments posted in an online event. We encourage robust discussion, the exchange of scientific ideas, and the sharing of multiple, diverse perspectives. We expect the discussion to be consistent with the norms of scholarly research community interactions at events. Online event participants should report any comments or content that falls short of those community norms. We will remove comments, content, or people that are considered inappropriate by SPIE standards or that:

• 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.

Recording policy

Conferences, courses, and poster sessions: For copyright reasons, recordings of any kind are prohibited without prior written consent of the presenter or instructor. Attendees may not capture or use materials presented in any meeting/course room or in course notes on display without written permission. Consent forms are available at speaker check-in, SPIE registration, or from SPIE online event hosts. Individuals not complying with this policy will be asked to leave a given session and/or asked to surrender their recording media. Refusal to comply with such requests is grounds for expulsion from the event.

Exhibition hall: Recordings of any kind are prohibited without explicit permission from on-site company representatives. Individuals not complying with this policy will be asked to surrender their recording media and to leave the exhibition hall. Refusal to comply with such requests is grounds for expulsion from the event.

Unauthorized solicitation

Unauthorized solicitation in the exhibition hall is prohibited. Any non-exhibiting organization observed to be distributing information or soliciting business in the aisles, or in another company's booth, will be asked to leave immediately.

Unsecured items

Personal belongings should not be left unattended in meeting rooms or public areas. Unattended items are subject to removal by security. SPIE is not responsible for items left unattended.

Wireless internet service

At most events, SPIE provides wireless access for attendees. Properly secure your computer before accessing the public wireless network. SPIE is not responsible for computer viruses or other kinds of computer damage.

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NOTES

HARASSMENT

Harassment consists of unwanted, unwelcomed, and uninvited behavior that demeans, threatens, or offends another.

SPIE is committed to providing a harassment- and discrimination-free experience for everyone at our events, an experience that embraces the richness of diversity where participants may exchange ideas, learn, network, and socialize in the company of colleagues in an environment of mutual respect.

It is SPIE policy that all employees, volunteers, and participants are entitled to respectful treatment. Any form of bullying, discrimination, harassment, sexual or otherwise, is unacceptable and will not be tolerated.

To report harassment you have witnessed or experienced at an event or meeting contact any SPIE staff member or use the SPIE Reporting Hotline:
1-888-818-6898 or **spie.ethicspoint.com**