



5th International Conference on Optics,
Photonics and Lasers

Conference Programme

18-20 May 2022

Tenerife (Canary Islands), Spain



Message from Chairman

On behalf of Organizing Committee I would like to welcome you to the 5th International Conference on Optics, Photonics and Lasers (OPAL' 2022), which will take place on 18-20 May 2022 in Hard Rock Hotel, Adeje, Tenerife (Canary Islands), Spain. The Series of annual OPAL conferences is a forum for presentation, discussion, exchange of information and latest research and development results in both theoretical and experimental research in optics, photonics and lasers, and their related fields. It brings together researchers, developers, and practitioners from diverse fields including international scientists and engineers from academia, research institutes, and companies to present and discuss the latest results in the mentioned field. The first OPAL' 2018 conference was held in Barcelona, Spain, 9-11 May 2018, the second OPAL' 2019 conference – in Amsterdam, The Netherlands, 24-26 April 2019, the third OPAL' 2020 conference – online, and the fourth OPAL' 2021 – in Corfu, Greece, 13-15 October 2021.

The conference is organized by the *International Frequency Sensor Association (IFSA)* – one of the major professional, non-profit association serving for industry and academy more than 20 years, with media partners: *Institute of Physics (IOP)*, (UK), *PhysicsWorld* (UK), *MDPI Chemosensos*, and *MDPI Photonics* open access journals (Switzerland), in technical cooperation with *IFSA Publishing S. L.* (Spain).

The previous OPAL conferences have attracted researchers and practitioners in the related fields, from around the world. The events are focusing any significant breakthrough and innovation in Optics, Photonics and Lasers, and its applications with broadest concept.

We trust that you will find OPAL' 2022 conference professionally rewarding and stimulating as well as enjoyable. Welcome to OPAL' 2022 !

Prof., Dr. Sergey Y. Yurish
OPAL' 2022 Conference Chairman

Conference Venue

The Conference will take place on 18-20 May 2022 in the Hard Rock Hotel, conference room *Wembley*.

Insurance and Liability

The conference organizers do not accept responsibility for any individual, medical, travel or personal insurance policies as necessary.

Registration

The Registration Desk is open in the Hard Rock Hotel:

- Tuesday, 17 May, 19:00-21:30 (in the Welcome Cocktail area)
- Wednesday, 18 May, 8:45-18:00 (near the conference room *Wembley I*)
- Thursday, 19 May, 8:45-18:00 (near the conference room *Wembley I*)
- Friday, 20 May, from 8:45-12:00 (near the conference room *Wembley I*)

Language

The official language of the Conference is English. There will be no simultaneous interpretation.

Conference Identification Tag

The Organizing Committee request that you wear your identification tag (badge) at all times during the conference. Your conference identification tag will serve as your admission to all conference paper presentation sessions and social events.

Coffee/Tea Refreshment

Coffee/tea will be served near the *Wembley I* Conference Room at the times indicated in the programme

Special Issues of journals

Selected papers from the conference will be published in the special issue on 'Optic, Photonics & Lasers' of open access *Sensors & Transducers* journal (ISSN: 2306-8515, e-ISSN 1726-5479) in both: print and electronic formats; or in the special issue on '*Optical Chemical Sensors and Spectroscopy*' of MDPI *Chemosensors* open access journal (ISSN 2227-9040) or MDPI *Photonics open access journal* (ISSN 2304-6732), electronic format. All authors of selected papers will be invited to submit their extended papers into the appropriate journals.

'Advances in Optics: Reviews' Book Series

The limited number of full-page papers published in journals will be selected by the journal's Editorial Board to extend into book chapters for the 'Advances in Optics: Reviews', Book Series, Vol. 6. This open access book volume will be published in 2022. The first five volumes published in 2018-2021 have been accepted by all Optical Community with a great enthusiasm.

Organizing Committee

Chairman

Prof. Sergey Y. Yurish (*IFSA, Spain*)

Advisory Chairmen

Dr. Qiang Wu (*Northumbria University, Newcastle Upon Tyne, UK*)

Prof. Claude Phipps (*Photonic Associates, USA*)

Prof. Boris Mizaikoff (*Ulm University, Germany*)

Prof. George Semouchkin (*Michigan Technological University, USA*)

Prof. Sandeep Singh Sengar (*Cardiff Metropolitan University, UK*)

Prof. Mahmoud Daoudi (*National Center for Nuclear Sciences and Technologies, Tunisia*)

Prof. Ali H. Reshak (*University of Basrah, Iraq*)

Conference and Publication Manager

Mrs. Tetyana Zakharchenko (*IFSA Publishing, S.L., Spain*)

Local Time

The local time in Tenerife is: GMT+1.

Welcome Cocktail

17 May 2022, Tuesday (20:00-22:00), Hard Rock Hotel, the 16th floor (Sky Lounge Bar) situate on the Hard Rock Hotel's Nirvana Tower building's roof. Do not miss this opportunity to say the first "hello" to attendees and committee members.

Gala Dinner

19 May 2022, Thursday (20:00-23:00). The Gala Dinner will take place in the Hard Rock Hotel.

Best Paper Award

MDPI Photonics Open Access journal has announced the Best Paper Award (400.00 EUR), which will be given to the authors of the best paper devoted to photonics and presented at the OPAL' 2022 conference.

Travel to Spain

The current requirements and rules for travelling to Spain are available at:

<https://reopen.europa.eu/en/map/ESP/7001>

Conference's web site:

<http://www.opal-conference.com>

Sponsors and Media Partners:



Keynote Speakers



Prof., Dr. Boris Mizaikoff

Institute of Analytical and Bioanalytical Chemistry, Ulm University, Germany and Hahn-Schickard, Institute for Microanalysis Systems, Ulm, Germany

Photonics in Food Safety: Can Mid-Infrared Spectroscopy Hunt a Cereal Killer?

Abstract

Photonic technologies have seen revolutionary developments in the past decades leading from conventional optics to on-chip photonic devices. Owing to the recent advances in mid-infrared (3-15 μm MIR) laser technology, especially cascade laser spectroscopy (CSL) has evolved into a state-of-the-art tool for the selective and sensitive quantification of trace analytes in liquid, solid, and gaseous state in a wide variety of sensing scenarios. High output power, narrow linewidths, single-mode operation, low power consumption, broad tunability and compact dimensions are just some of the most outstanding features of cascade lasers. Since their introduction, quantum cascade lasers (QCL) and interband cascade lasers (ICL) have rapidly matured, and have established themselves as the probably most important contemporary MIR laser light sources.

In this presentation, we will discuss state-of-the-art MIR sensing platforms that benefit from cascade lasers via their combination with innovative thin-film waveguide technologies providing direct access to molecule-specific information using evanescent field sensing schemes at yet unprecedented levels of sensitivity. However, decreasing the analytically probed volume may adversely affect the associated analytical figures of merit such as the signal-to-noise-ratio, the representativeness of the sample, or the fidelity of the obtained analytical signal. We will discuss the resulting consequences and strategies for a particularly relevant field of applications – food safety and food quality. As an example, we will highlight the detection of fungal infections and the resulting mycotoxin contamination of food, feed and commodities via MIR photonic sensing systems ... and we will answer the question as to whether photonic technologies are indeed able to hunt a cereal killer !

Short Biography

Dr. Boris Mizaikoff is a Chaired Professor and Director of the Institute of Analytical and Bioanalytical Chemistry at Ulm University, Germany. Since 2021, he is also a Director at the Hahn-Schickard Institute for Microanalysis Systems in Ulm. His research interests focus on optical sensors, biosensors, and biomimetic sensors in the mid-infrared spectral range, system miniaturization and integration based on micro- and nanofabrication, multifunctional (nano) analytical platforms, development of biomolecular/biomimetic recognition architectures, multivariate data evaluation, and applications in environmental analytics, process analysis, and biomedical/clinical diagnostics. He is author/co-author of 380+ peer-reviewed publications, 18 patents, and 100+ plenary, keynote, and invited contributions at scientific conferences.



Prof., Dr. Deepa Sharma

Department of Higher Education, Government of Haryana, India

Machine Learning Methods applied to Vibrational Spectroscopy: New Horizons

Abstract

Machine Learning Methods have revolutionized almost every sphere of research over the last decade. Vibrational Spectroscopy is also not an exception to this. This keynote presentation explores the emerging horizon where the Machine Learning and Vibrational Spectroscopy meet. Machine learning methods are being used by the spectroscopists for functional group identification, spectrum prediction, spectrum-based structure recognition and explanatory analysis of spectroscopic data. Algorithms are being written to generate the data set with an artificial neural network that may be used to predict spectroscopic properties of interest. Since its advent, vibrational spectroscopy has been widely used to characterize the properties of test samples in various biomedical and engineering fields. Many of these tasks require the analysis of recorded vibrational signals to extract information, which can be achieved using machine learning. Broadly speaking, any task that analyses a signal for fetching the information can be regarded as a potential application of artificial intelligence. The conventional artificial intelligence methods adopt a knowledge-based analytical approach which has various limitations. However, new learning-based approach when implemented using specific machines has provided us with different machine learning methods which when combined with the previous spectroscopic techniques will open new routes for novel research.

Short Biography

Dr. Deepa Sharma is a theoretical physicist with expertise in computational nano-physics spanning across Spectroscopy, Optics, Condensed Matter Physics and Electronics. Her research work is focused mainly upon simulation and modelling of carbon nanomaterials and calculation of their electronic, spectroscopic and optical properties based on Density Functional Theory and Tight Binding Model. Her recent theoretical prediction of the possibility of proximity induced superconductivity in singlewalled carbon nanotubes has proven to be path-

breaking paving a novel research pathway for the experimentalists to explore. She is serving as an assistant professor of Department of Higher Education, Government of Haryana, India.

Programme at Glance

| Time/Date (GMT+1) | 18.05.2022 Wednesday | 19.05.2022 Thursday | 20.05.2022 Friday |
|----------------------|--|---|--|
| | <i>Room Wembley I</i> | | <i>Room Wembley II</i> |
| 8:45-9:00 | Registration | Registration | Registration |
| 9:00-9:15 | * Opening Session | * Daily announcements | Virtual Session in Zoom (live streams): <i>Lasers, Optoelectronic Devices and Sensors</i> |
| 9:15-10:00 | Keynote Speaker I Boris Mizaikoff, <i>Ulm University (Germany)</i> | Keynote Speaker II Deepa Sharma <i>Deenbandhu Choturam University (India)</i> | |
| 10:00-10:30 | <i>Coffee Break</i> | <i>Coffee Break</i> | - |
| 10:30-12:30 | Regular Session: <i>Photonics and Nanophotonics</i> | Regular Session: <i>Lasers and their Applications I</i> | <i>Poster Session & Farewell Cocktail</i> |
| 12:30-13:30 | <i>Lunch on your own</i> | <i>Lunch on your own</i> | * Closing Session (12:30 – 13:00) |
| 13:30-15:30 | Regular Session: <i>Optical Sensors and MOEMS</i> | Regular Session: <i>Lasers and their Applications II</i> | - |
| 15:30-16:00 | <i>Coffee Break</i> | <i>Coffee Break</i> | |
| 16:00-18:00 | Regular Session: <i>Optical Fiber Devices, Communication and Networks</i> | Regular Session: <i>Optics, Optical Computing and Quantum Information</i> | |
| 18:00-20:00 | - | - | |
| 20:00-23:00 | - | <i>Gala Dinner</i> | |

* The must attend sessions.

Technical Conference Programme

Day 1

18 May 2022, Wednesday

Regular Session: Photonics and Nanophotonics

(Wembley / Conference Room):

Chairman: Prof., Dr. Boris Mizaikoff

Ulm University and Hahn-Schickard, Institute for Microanalysis Systems, Ulm (Germany)

- 1. Quantum dot coupling into hybrid InP-Si waveguide modes for on-chip integrated photonics**
Paweł Mrowiński, Grzegorz Sęk and Marcin Syperek
(Poland)
- 2. Single SiGe quantum dot coupled to bichromatic photonic crystal cavities for potential applications as single telecom photon emitters**
Thanavorn Poempool, Johannes Aberl, Marco Clementi, Lukas Spindlberger, Lada Vukušić, Matteo Galli, Dario Gerace, Friedrich Schäffler, Moritz Brehm and Thomas Fromherz
(Austria, Italy)
- 3. Preparation and investigation of a nanostructured tuneable hybrid mirror for a high-energy Tamm plasmon state generation**
Alexandr Belosludtsev, Oleksandr Buchnev and Vassili Fedotov
(Lithuania, UK)
- 4. Highly sensitive plasmonic sensor device made of Au nanoantennas on SiO₂ nanopillar arrays**
Priyamvada Venugopalan and Sunil Kumar
(UAE)

Regular Session:
Optical Sensors and MOEMS
(*Wembley I Conference Room*):

Chairman: Dr. Paweł Mrowiński
Wrocław University of Science and Technology (Poland)

- 1. Measurement of transonic airflow in a compressor blade cascade by spatial carrier interferometry**
Pavel Psota, Gramoz Cubreli and David Šimurda
(*Czech Republic*)

- 2. High temperature characterization of a femtosecond laser micromachined fiber in-line Fabry-Pérot pressure sensor**
Wendy Tomboza, Romain Cotillard, Nicolas Roussel, Minh Chau Phan Huy, Géraud Bouwmans and Guillaume Laffont
(*France*)

- 3. Optomechanical inertial sensing and displacement interferometry**
Felipe Guzman (*USA*)

- 4. Efficient optomechanical mode-shape mapping of micromechanical devices in the presence of crosstalk**
David Hoch, Kevin-Jeremy Haas, Leopold Moller, Julius Röwe, Timo Sommer, Pedro Soubelet, Jonathan Finley and Menno Poot
(*Germany*)

Regular Session:
Optical Fiber Devices, Communication and Networks
(*Wembley I Conference Room*):

Chairman: Dr. Pavel Psota
Technical University of Liberec (*Czech Republic*)

- 1. Recent design evolution and new trends of hollow core optical fibers**
Walter Belardi
(*France*)

- 2. Development of efficient clad-pumped fiber optical amplifiers for telecommunication systems**
Jurgis Grube, Edgars Elsts, Andis Supe, Sandis Spolitis,
Vjaceslavs Bobrovs and Jurgis Porins
(*Latvia*)

- 3. High-speed WDM transmission over SI-POF**
Ulrich Fischer-Hirschert and Mladen Jončić
(*Germany*)

- 4. Performance evaluation of a network cluster operating in the solar-blind UV-C band under a Non-Line-of-Sight regime (pre-recorded video presentation)**
Nikos Raptis, Georgios Pekridis, Konstantinos Krilakis, Konstantinos Panoliaskos, Evgenia Roditi and Dimitris Syvridis
(*Greece*)

Day 2
19 May 2022, Thursday

Regular Session:
Lasers and their Applications I
(*Wembley I Conference Room*):

Chairman: Prof., Dr. Ulrich Fischer-Hirchert
Harz University of Applied Sciences (Germany)

- 1. Laser fabrication of different crystals by pulsed Bessel beams**
Akhil Kuriakose, Monica Bollani, Paolo Di Trapani
and Ottavia Jedrkiewicz
(*Italy*)
- 2. Synthesis of adjacent Stokes spectra in a two-stage transient stimulated Raman chirped-pulse amplifier**
Paulius Mackonis, Augustinas Petrušenas and Aleksej Rodin
(*Lithuania*)
- 3. Generation of femtosecond pulses up to 3 μm by combining OPCPA with transient stimulated Raman amplification**
Augustinas Petrušenas, Paulius Mackonis and Aleksej Rodin
(*Lithuania*)
- 4. Propagation of azimuthally polarized Bessel-Gaussian beam through helical axicon (pre-recorded video presentation)**
Ibrahim Loqman, Abdu Alkelly and Hassan Alahsab
(*Yemen*)

Regular Session:
Lasers and their Applications II
(*Wembley I Conference Room*):

Chairman: Dr. Aleksej Rodin

*Solid State Laser laboratory, Center for Physical Sciences and
Technology (Lithuania)*

- 1. Superhydrophobic polycarbonate fabrication for antibacterial applications (pre-recorded video presentation)**
Sahar Sohrabi, Hedieh Pazokian, Bijan Ghafary, Mahmood Mollabashi and MontazerAlghaem
(*Iran*)
- 2. Combining bright-field and second harmonic generation microscopy for the characterization of thyroid nodules**
Radu Hristu, Lucian Eftimie, Stefan Stanciu and George Stanciu
(*Romania*)
- 3. High Type A refractive index change by multi-scan cumulative inscriptions in photosensitive glasses**
Laura Loi, Théo Guérineau, Sylvain Danto, Thierry Cardinal, Yannick Petit and Lionel Canioni
(*France*)
- 4. Preparing Satellites for Active Debris Removal and Ranging (pre-recorded video presentation)**
Claude Phipps and Christophe Bonnal
(*USA, France*)

Regular Session:
Optics, Optical Computing and Quantum Information
(*Wembley I Conference Room*):

Chairman: Dr. Radu Hristu
University Politehnica of Bucharest (Romania)

- 1. Optical computation of a spin glass dynamics with adaptive optics**
Marco Leonetti, Luca Leuzzi, Giorgio Parisi, Erick Hörmann and Giancarlo Ruocco (*Italy*)
- 2. Nonlinear upconversion effect for enhancement of curing depths in laser-assisted 3D printing of photopolymers**
Adilet Zhakeyev and Jose Marques-Hueso (*UK*)
- 3. Temporal Talbot Effect in Birefringent optical filters for multiplying pulse repetition rates (pre-recorded video presentation)**
Youcef Driouche, Rachid Hamdi, Leila Graini, Abderezzaq Halassi and Badr-Eddine Benkelfat (*Algeria, France*)
- 4. Anti-squeezing noise in continuous-variable quantum communication**
Vladyslav Usenko (*Czech Republic*)

Day 3
20 May 2022, Friday

Virtual Session:
Lasers, Optoelectronic Devices and Sensors
(live streams in Zoom):

Chairman: Prof., Dr. Sergey Y. Yurish
International Frequency Sensor Association (IFSA), Barcelona, Spain

- 1. Characterization and comparison of CubeSat and drone platform jitter effects on laser beam pointing stability**
Femi Ishola, Alberto Carrasco-Casado, Phuc Trinh, Koichi Shiratama, Hirokazu Masui, Rodrigo Cordova, Mengu Cho, Tetsuharu Fuse, Hiroyuki Tsuji and Morio Toyoshima
(Japan)
- 2. Bulk Dirac semimetal for the exploration of terahertz optoelectronic devices**
Tony Blessan, Chakravarthy Venkateswaran and Natesan Yogesh
(India)
- 3. Tests and developments of a NIR laser CO₂ sensor based on dense-pattern multipass gas cell (France)**
Florent Defosse, Clément Jacquemin, Raphaël Vallon, Bertrand Parvitte and Virginie Zéninari
(France)

Poster Session
(Wembley II Conference Room):
20 May 2022 (10:30-12:30)

- 1. Electrically controlled multiferroic photonic grating**
Ramaz Khomeriki (*Georgia*)
- 2. Near Infrared diffused reflectance on tissue simulating phantoms for optical applications**
Panayiota Demosthenous and Matthias Baer (*Cypris, Germany*)
- 3. Infrared spectroscopic application using an integrating sphere for measuring vapor Ethanol**
Panayiota Demosthenous and Matthias Baer (*Cypris, Germany*)
- 4. Water-repellent coatings based on anodized aluminum under femtosecond laser ablation**
Aleksej Rodin (*Lithuania*)
- 5. Bipolar organic semiconductors based on carbazole and diphenyl imidazole as deep-blue OLED emitters and hosts for sky-blue, green and red PhOLEDs**
Oleksandr Bezikonnyi, Viktorija Andrulėviciene, Dmytro Volyniuk, Rasa Keruckiene, Kamilė Vaiciulaitė, Ervinas Urbonas and Juozas Vidas Grazulevicius (*Lithuania*)
- 6. Comparison of various sublimation matte coating sprays for the optical 3D scanning with a focus on the quality of 3D scans**
Jakub Franke, Tomáš Koutecký and Daniel Koutný (*Czech Republic*)
- 7. Volume Gratings for the recording of a waveguide on photopolymers**
Cristian Neipp, Juan Carlos Bravo, Joan Josep Sirvent, Marta Morales, Tomas Lloret, Daniel Puerto and Sergi Gallego Rico (*Spain*)
- 8. Near-field probes based on nanocones and nanopyramides**
Dusan Pudis, Anton Kuzma, Petra Maniakova, Martin Feiler, Daniel Jandura and Matej Goraus (*Slovakia*)

9. Application of transparent machine learning method for skin lesions classification from multispectral reflectance images

Dmitrijs Bliznuks, Katrina Bolochko, Emilija Vija Plorina, Alexey Lihachev and Ilze Lihacova (*Latvia*)

10. Polymer-based inverted pyramids for SERS

Ivana Lettrichová, Daniel Jandura, Peter Gaso, Dusan Pudis and Anton Kuzma (*Slovakia*)

11. Polymer inverted refractive-Index-contrast grating prepared by laser lithography on Si substrate

Daniel Jandura, Peter Gaso, Jan Suffczyński, Tomasz Czyszanowski and Dusan Pudis (*Slovakia, Poland*)

12. Laser processing by ultrafast bursts of pulses

Andrius Žemaitis, Mantas Gaidys, Paulius Gečys and Mindaugas Gedvilas (*Lithuania*)

13. Birefringent pulse shaper using non-identical crystals

Youcef Driouche, Rachid Hamdi, Leila Graini, Abderezzaq Halassi and Badr-Eddine Benkelfat (*Algeria, France*)

14. 1DPhC-based resonant cavity for optical fiber sensing

Jana Durisova, Tomas Mizera, Roman Kaňok, Petr Hlubina, Dušan Pudiš, Peter Gašo and Daniel Jandura (*Slovakia, Czech Republic*)

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