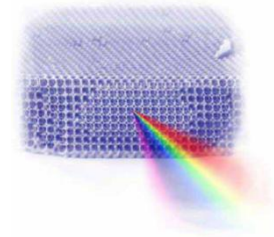


University of Belgrade  
Institute of Physics Belgrade  
Kopaonik, March 12-15, 2023



Book of Abstracts  
**16<sup>th</sup> Photonics Workshop**  
(Conference)



# 16<sup>th</sup> Photonics Workshop (2023)

## Book of abstracts

Kopaonik, Serbia, March 12-15, 2023

Publisher, 2023:

Institute of Physics Belgrade

Pregrevica 118

11080 Belgrade, Serbia

Editors:

Dragan Lukić, Marina Lekić, Zoran Grujić

**ISBN 978-86-82441-59-5**

Printed by:

NEW IMAGE d.o.o.

Tošin Bunar 185, Belgrade

Number of copies: 55

CIP - Каталогизација у публикацији - Народна библиотека Србије, Београд

535(048)  
681.7(048)  
66.017/.018(048)

**PHOTONICS Workshop (16; 2023; Kopaonik)**

Book of Abstracts / 16th Photonics Workshop, (Conference), Kopaonik, March 12-15, 2023; [organized by Institute of Physics Belgrade, Photonics center [and] Optical Society of Serbia]; [editors Dragan Lukić, Marina Lekić, Zoran Grujić]. - Belgrade: Institute of Physics, 2023 (Belgrade: New image). - 68 str.: ilustr; 25 cm

Tiraž 55. - Registar.

ISBN 978-86-82441-59-5

а) Оптика -- Апстракти б) Оптоелектроника -- Апстракти в) Технички материјали -- Апстракти

COBISS.SR-ID 109912585

## **Scientific Committee:**

**Wolfgang Fritzsche**, *Leibniz Institute of Photonic Technology, Germany*

**Lars Klimaschewski**, *Innsbruck Medical University, Austria*

**Srdjan Antic**, *Institute for Systems Genomics, Stem Cell Institute, University of Connecticut, USA*

**Theo Scholtes**, *Leibniz Institute of Photonic Technology, Germany*

**Arne Wickenbrock**, *Helmholtz Institute, Johannes Gutenberg University Mainz*

**Hrvoje Skenderović**, *Institute of Physics, Zagreb, Croatia*

**Gülnur Aygün Ozyuzer**, *Izmir Institute of Technology, Turkey*

**Evgeny Gurevich**, *University of Applied Sciences in Muenster, Germany*

**Ljupčo Hadžievski**, *Vinča Institute of Nuclear Sciences, Serbia*

**Pavle Anđus**, *Faculty of Biology, University of Belgrade, Serbia*

**Branislav Jelenković**, *Institute of Physics Belgrade, Serbia*

**Marina Lekić**, *Institute of Physics Belgrade, Serbia*

**Aleksander Kovačević**, *Institute of Physics Belgrade, Serbia*

**Zoran Grujić**, *Institute of Physics Belgrade, Serbia*

**Borislav Vasić**, *Institute of Physics Belgrade, Serbia*

**Svetlana Savić - Šević**, *Institute of Physics, University of Belgrade*

## **Organizing Committee:**

**Marina Lekić (chair)**, *Institute of Physics Belgrade*

**Zoran Grujić (webmaster)**, *Institute of Physics Belgrade*

**Aleksander Kovačević (secretary)**, *Institute of Physics Belgrade*

**Dragan Lukić**, *Institute of Physics Belgrade*

**Branislav Jelenković**, *Institute of Physics Belgrade*

**Bojana Bokić**, *Institute of Physics Belgrade*

**Uroš Ralević**, *Institute of Physics Belgrade*

**Aleksandra Milenković**, *Institute of Physics Belgrade*

## Organized by:



Photonics center, Institute of Physics Belgrade



Optical Society of Serbia

## Sponsors:




Ministry of Science, Technological Development and Innovation of  
the Republic of Serbia



## Acknowledgements

Organizing Committee of the „16<sup>th</sup> Photonics Workshop (2023)“ expresses its gratitude for financial support obtained from:

-  Optical society of Serbia
-  Ministry of Science, Technological Development and Innovation of the Republic of Serbia
-  Analysis d.o.o.

## Conference program

### Sunday, March 12<sup>th</sup>

**Chairman: Branislav Jelenković**

16.00 – 16.30	<b>Registration &amp; opening</b>
16.30 - 17.00	<b>Goran Mashanovich</b> <i>Mid-Infrared Silicon Photonics for Sensing</i>
17.00 - 17.20	<b>Bratislav Marinković</b> <i>"Photoelectron" Spectroscopy by Electron Impact: Scattered and Ejected Electrons</i>
17.20 – 17.40	<b>Danka Stojanović</b> <i>Data enrichment and calibration for PM 2.5 low-cost optical sensors</i>
17.40 – 18.00	<b>Dušan Božanić</b> <i>Valence Band Electronic Structure of Azobenzene-Functionalized Gold Nanoparticles</i>
18.00 – 18.15	<b>Duška Popović</b> <i>Analysis of the photoelectron energy spectra at resonant two-photon ionization of hydrogen atom by intense short laser pulses</i>
18.15 – 18.30	<b>Vladimir Damljanović</b> <i>Atlas of electronic band structures in two-dimensional materials</i>

**Monday, March 13<sup>th</sup>****Chairman: Zoran Grujić**

16.00 - 16.30	<b>Refreshment</b>
16.30 - 17.00	<b>Ferruccio Renzoni</b> <i>Electromagnetic Induction Imaging with Atomic Magnetometers: Pushing the Boundaries</i>
17.00 - 17.20	<b>Vladimir Đoković</b> <i>Gold-riboflavin hybrid nanostructures as possible photodynamic therapy agents</i>
17.20 – 17.40	<b>Nikola Stojanović</b> <i>Femtosecond laser spectroscopy for Exploration of Space</i>
17.40 – 17.55	<b>Merve Ekmekçioğlu</b> <i>Properties of Multilayer ZTO/Ag/ZTO Thin Film Electrodes Deposited by Magnetron Sputtering</i>
17.55 – 18.10	<b>Petar Atanasijević</b> <i>Thermoelectric temperature control of Morpho butterfly wings used for radiation sensing</i>
18.10 – 18.25	<b>Miloš Davidović</b> <i>Combining size distribution spectrums of ambient aerosols using equivalent optical properties of nanosized particles – selected examples from the Bay of Kotor</i>

**Chairman: Bratislav Marinković**

20.00 - 20.30	<b>Robert Loew</b> <i>Making hot atoms interact</i>
20.30 - 20.50	<b>Predrag Tadić</b> <i>Photoplethysmogram as a source of biomarkers for AI-based diagnosis of heart failure</i>
20.50 - 21.10	<b>Gulnur Aygun Ozyuzer</b> <i>The Effect of ZTO Interlayer Between LCO and LLZO Used in All Solid State Batteries</i>
21.10 - 21.25	<b>Mirjana Stojanović</b> <i>Localized modes in linear flux dressed two-dimensional plus lattice</i>
21.25 – 21.40	<b>Nataša Bon</b> <i>The Investigation of The Central Activity and Stellar Population Parameters in Active Galactic Nuclei</i>
21.40 – 22.00	<b>Edi Bon</b> <i>Spectroscopic modeling of supermassive binary black hole orbits in active galactic nuclei</i>
22.00 – 22.15	<b>Aleksander Kovačević</b> <i>Beam modification during propagation through aqueous microalgae suspension of interest to waveguiding</i>

**Tuesday, March 14<sup>th</sup>****Chairman: Ljupčo Hadžievski**

16.00 - 16.30	<b>Refreshment</b>
16.30 - 17.00	<b>Vladan Vuletić</b> <i>Quantum Simulation and Computation with Neutral Atoms</i>
17.00 - 17.20	<b>Branislav Jelenković</b> <i>Squeezed light by FWM in alkali vapor – generation and application</i>
17.20 – 17.40	<b>Caterina Credi</b> <i>Straightforward integration of SERS technology within novel opto-fluidic devices for rapid liquids probing with high sensitivity</i>
17.40 – 18.00	<b>Sara Nocentini</b> <i>Temperature-controlled polymer nanopatterning for 4D tunable photonics</i>
18.00 – 18.15	<b>Jovana Petrović</b> <i>Ultra-low-loss broadband multiport optical splitters</i>
18.15 – 18.35	<b>Mehtap Ozdemir</b> <i>Optimization of Large Area Thin Films for All Solid State Electrochromic Devices</i>

**Chairman: Ivana Drvenica**

20.00 - 20.30	<b>Srdjan Antic</b> <i>The Role of Physics in Modern Neuroscience</i>
20.30 - 20.50	<b>Ljiljana Nikolić</b> <i>Application of optogenetics for studying neuronal activity via glial photostimulation</i>
20.50 - 21.05	<b>Katarina Milićević</b> <i>In vitro testing of genetically encoded voltage indicator ArcLightD for recording spontaneous electrical activity of cortical neurons</i>
21.05 – 21.25	<b>Dejan Pantelić</b> <i>Thermal radiation imaging of insects using lockin techniques</i>
21.25 – 21.40	<b>Vladimir Atanasoski</b> <i>Autocorrelation for denoising biomedical signals</i>
21.40 – 21.55	<b>Kolja Bugarski</b> <i>Localized modes in SSH photonic lattice in the presence of defects and local nonlinearity</i>
21.55 – 22.15	<b>Dragan Lukić</b> <i>Proposal for a new surveillance system for military vehicles and a new crew arrangement</i>

**Wednesday, March 15<sup>th</sup>****Chairman: Dušan Božanić**

16.00 - 16.30	<b>Refreshment</b>
16.30 - 17.00	<b>Lutfi Ozyuzer</b> <i>Chiral Devices for Terahertz Waves Based on Tunable Metamaterials</i>
17.00 - 17.20	<b>Yasemin Demirhan</b> <i>Terahertz Metamaterials and Multispectral Terahertz Plasmonic Detectors</i>
17.20 – 17.40	<b>Željko Šljivančanin</b> <i>Computational modeling of magnetism induced in nonmagnetic 2D materials</i>
17.40 – 17.55	<b>Nurcin Karadeniz</b> <i>The Characterizations of Thin Film Filters for Far UVC 222 nm Excimer Lamps</i>
17.55 – 18.10	<b>Milica Nedić</b> <i>Impact of the vortex distortion phase on the efficiency of lasing zero-mode</i>
18.10 – 18.25	<b>Nikola Vuković</b> <i>Modeling of optical properties of novel terahertz photonics quantum well heterostructures</i>

**Chairman: Aleksander Kovačević**

20.00 - 20.20	<b>Zoran Grujić</b> <i>Heading error of Free Alignment Precession optically pumped magnetometer</i>
20.20 - 20.40	<b>Theo Scholtes</b> <i>A compact pump-probe optically pumped magnetometer system with different valence state</i>
20.40 - 20.55	<b>Jonas Hinkel</b> <i>Optically pumped magnetometer aiming for highest accuracy</i>
20.55 - 21.10	<b>Tim Kügler</b> <i>Functionalization of microfabricated cesium vapor cells for optically pumped magnetometers</i>
21.10 – 21.25	<b>Marija Čurčić</b> <i>Response of a scalar Mx magnetometer to the transverse modulation of magnetic field</i>
21.25 – 21.40	<b>Aleksandra Milenković</b> <i>Affordable VCSEL diode laser for high resolution spectroscopy of cesium D1 line</i>
21.40 – 21.55	<b>Miloš Subotić</b> <i>Frequency Estimating Device for Optically Pumped Magnetometer</i>
21.55 – 22.10	<b>Andrej Bunjac</b> <i>Analysis of the dynamic RF projection phase in True Scalar Cs Magnetometers</i>



## Table of Contents

Spectroscopic modeling of supermassive binary black hole orbits in active galactic nuclei.....	12
The Investigation of The Central Activity and Stellar Population Parameters in Active Galactic Nuclei.....	13
Making hot atoms interact .....	14
Atlas of electronic band structures in two-dimensional materials .....	15
"Photoelectron" Spectroscopy by Electron Impact: Scattered and Ejected Electrons .....	16
Localized modes in SSH photonic lattice in the presence of defects and local nonlinearity .....	17
Temperature-controlled polymer nanopatterning for 4D tunable photonics.....	18
Ultra-low-loss broadband multiport optical splitters .....	19
Thermoelectric temperature control of <i>Morpho</i> butterfly wings used for radiation sensing .....	20
The Role of Physics in Modern Neuroscience.....	21
Femtosecond laser spectroscopy for Exploration of Space.....	22
Impact of the vortex distortion phase on the efficiency of lasing zero-mode.....	23
Photoplethysmogram as a source of biomarkers for AI-based diagnosis of heart failure.....	24
Autocorrelation for denoising biomedical signals .....	25
Combining size distribution spectrums of ambient aerosols using equivalent optical properties of nanosized particles – selected examples from the Bay of Kotor.....	26
Optical methodologies in the analysis of erythrocyte deformability and heterogeneity.....	27
The Effect of ZTO Interlayer Between LCO and LLZO Used in All Solid State Batteries .....	28
Terahertz Metamaterials and Multispectral Terahertz Plasmonic Detectors .....	29
The Characterizations of Thin Film Filters for Far UVC 222 nm Excimer Lamps .....	30
Mid-Infrared Silicon Photonics for Sensing .....	31
Fluorescence Correlation and Cross-Correlation Spectroscopy (FCS/FCCS) - versatile tool for quantitative characterization of molecular interactions <i>in vitro</i> and <i>in vivo</i> .....	32
Analysis of the photoelectron energy spectra at resonant two-photon ionization of hydrogen atom by intense short laser pulses.....	33
Effectiveness of two-antenna microwave ablation of large hepatocellular carcinoma.....	34
Three-dimensional simulations of the microwave tissue ablation .....	35
Localized modes in linear flux dressed two-dimensional plus lattice.....	36
Proposal for a new surveillance system for military vehicles and a new crew arrangement.....	37
Modeling of optical properties of novel terahertz photonics quantum well heterostructures .....	38
Computational modeling of magnetism induced in nonmagnetic 2D materials .....	39
Data enrichment and calibration for PM 2.5 low-cost optical sensors.....	40
Electromagnetic Induction Imaging with Atomic Magnetometers: Pushing the Boundaries .....	41
Straightforward integration of SERS technology within novel opto-fluidic devices for rapid liquids probing with high sensitivity .....	42

Thermal radiation imaging of insects using lockin techniques .....	43
<i>In vitro</i> testing of genetically encoded voltage indicator ArcLightD for recording spontaneous electrical activity of cortical neurons .....	44
Squeezed light by FWM in alkali vapor – generation and application .....	46
Application of optogenetics for studying neuronal activity via glial photostimulation .....	47
Properties of Multilayer ZTO/Ag/ZTO Thin Film Electrodes Deposited.....	48
Chiral Devices for Terahertz Waves Based on Tunable Metamaterials .....	49
Optimization of Large Area Thin Films .....	50
Valence Band Electronic Structure of Azobenzene-Functionalized Gold Nanoparticles.....	51
Gold-riboflavin hybrid nanostructures as possible photodynamic therapy agents .....	52
Beam modification during propagation through aqueous microalgae suspension of interest to waveguiding .....	53
Long term stability of graphene/c-Si Schottky-junction solar cells.....	54
Quantum Simulation and Computation with Neutral Atoms.....	56
Joint event: Free Alignment precession optically pumped magnetometer .....	57
A compact pump-probe optically pumped magnetometer system .....	58
Response of a scalar $M_x$ magnetometer to modulation the of transverse magnetic field.....	59
Commercially available vertical cavity surface emitting laser affordable VCSEL diode laser for low noise spectroscopy of cesium $D_1$ line.....	60
Optically pumped magnetometer aiming for highest accuracy.....	61
Functionalization of microfabricated cesium vapor cells for optically pumped magnetometers.....	62
Frequency Estimating Device for Optically Pumped Magnetometer .....	63
Heading error of Free Alignment Precession.....	64
Analysis of the dynamic RF projection phase in True Scalar Cs Magnetometers .....	65

## Impact of the vortex distortion phase on the efficiency of lasing zero-mode

Milica Nedić<sup>1</sup>, Goran Gligorić<sup>1</sup>, Jovana Petrovic<sup>1</sup>, Aleksandra Maluckov<sup>1</sup>

(1) COHERENCE, Department of Atomic Physics, Vinča Institute of Nuclear Sciences, National Institute of Republic of Serbia, University of Belgrade, P.O. Box 522, 11001 Belgrade, Serbia

Contact: Milica Nedić ([milica.brankovic@vin.bg.ac.rs](mailto:milica.brankovic@vin.bg.ac.rs))

**Abstract.** Photonic lattices of optical waveguides present a well-controlled platform for investigation of different phenomena associated with the topological characteristics of physical systems. Recently, the first experimental realization of a Majorana zero-mode bound at vortex-like distortion induced in the bulk of a 2D graphene-like photonic lattice is demonstrated in [1]. The observed modes lie mid-gap at zero energy and they are extremely robust to the perturbations to the underlying Hamiltonian. We use bipartite armchair hexagonal lattice and create a vortex topological defect by perturbing positions of the central waveguides and numerically examine how the eigenvalues spectrum depends on the distortion phase. The observed robustness of zero-mode is an indication that adding the saturable gain and linear loss to lattice can lead to efficient lasing. Starting from the noisy background, we achieve zero-mode lasing, shown in Figure 1. We further investigate its robustness to the changes in driving conditions and the vortex phase with the goal to find an efficient and steady lasing regime. These results can be used to design a new topological laser.

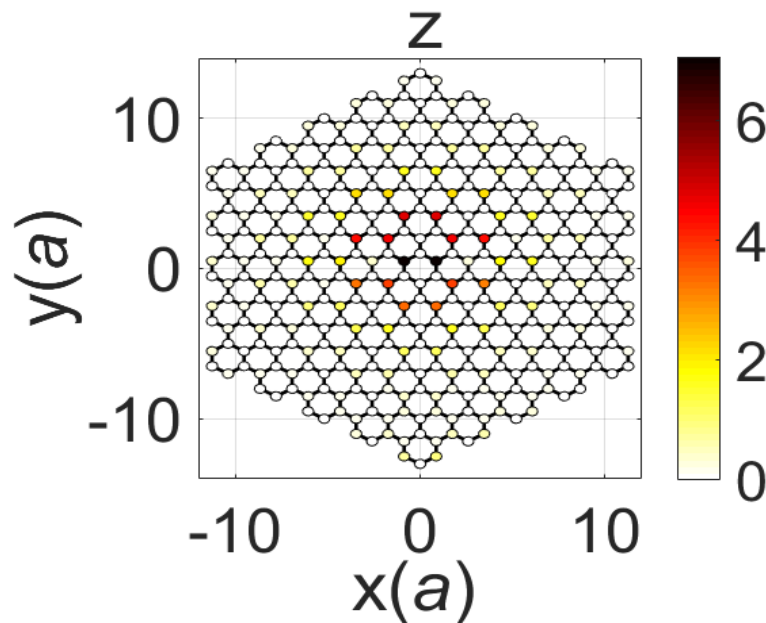


Figure 1. An example of the efficient lasing zero-mode initiated from the noisy background in hexagonal-shaped lattice with a vortex-like distortion.

### REFERENCES

- [1] A. J. Menssen, J. Guan, D. Felce, M. J. Booth, and I. A. Walmsley, *Phys. Rev. Lett.* **125** (2020), 117401.