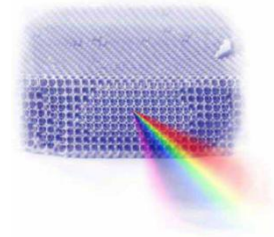


University of Belgrade  
Institute of Physics Belgrade  
Kopaonik, March 12-15, 2023



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



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

## Book of abstracts

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## 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>



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## Data enrichment and calibration for PM 2.5 low-cost optical sensors

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**Abstract.** Particulate matter (PM) in air has been proven to be hazardous to human health. Until recently, monitoring of air quality has been done by professional agencies. Nowadays, the availability of portable, low cost microsensor devices and the exponential growth of IoT (Internet of Things) in everyday life has enabled widespread monitoring of air quality among all citizens [1]. For PM measurements, optical sensors measure light scattering by particles carried in an air stream through a light beam, which is converted by computation to equivalent mass concentration. Light scattering is strongly affected by parameters such as particle density, particle hygroscopicity, refraction index, and particle composition [2].

In this study, we measured PM 2.5 by seven AQ MESH low-cost optical sensors and compared the measured data with the ones obtained from the reference monitoring station (SEPA). Could we, by a sequence of low-processing data enrichment and a simple calibration method, reach an accuracy as close as a calibration based on machine learning? To answer this question, we used low-processing data enrichment such as resampling, encoding periodic time-related features and making a composition of the initial low-cost signal at different time scales. We compared two algorithms for the calibration: multivariate linear regression and random forest. The results gave promising results and encouraged us in researching further about signal low-processing to achieve the required quality of data from low-cost sensor devices monitoring air quality [3].

Funding for this work has been provided by the EU H2020 Framework Programme for research and innovation under grant agreement no 952433 (VIDIS); EU 7<sup>th</sup> Framework Programme for research, technological development and demonstration under grant agreement no 308524 (CITI-SENSE); Ministry of Education, Science and Technological Development of the Republic of Serbia under themes 1002201 and 0402312 which are realized in Vinca Institute of Nuclear Sciences (under contract number 451-03-47/2023-01/ 200017). The authors gratefully acknowledge the Serbian Environmental Protection Agency (SEPA) for access to their automatic air-quality monitoring station and data.

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- [2] F. Karagulian et al., *Atmosphere* **10** (2019), 1-41
- [3] D. B. Stojanovic et al., *Thermal Science*, **221** (2023), 1-14.