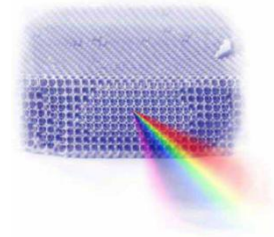


University of Belgrade
Institute of Physics Belgrade
Kopaonik, March 12-15, 2023



Book of Abstracts
16th Photonics Workshop
(Conference)



16th 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) Оптиелектроника -- Апстракти в) Технички материјали -- Апстракти

COBISS.SR-ID 109912585

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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 „16th 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 12th

Chairman: Branislav Jelenković

16.00 – 16.30	Registration & opening
16.30 - 17.00	Goran Mashanovich <i>Mid-Infrared Silicon Photonics for Sensing</i>
17.00 - 17.20	Bratislav Marinković <i>"Photoelectron" Spectroscopy by Electron Impact: Scattered and Ejected Electrons</i>
17.20 – 17.40	Danka Stojanović <i>Data enrichment and calibration for PM 2.5 low-cost optical sensors</i>
17.40 – 18.00	Dušan Božanić <i>Valence Band Electronic Structure of Azobenzene-Functionalized Gold Nanoparticles</i>
18.00 – 18.15	Duška Popović <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	Vladimir Damljanović <i>Atlas of electronic band structures in two-dimensional materials</i>

Monday, March 13th**Chairman: Zoran Grujić**

16.00 - 16.30	Refreshment
16.30 - 17.00	Ferruccio Renzoni <i>Electromagnetic Induction Imaging with Atomic Magnetometers: Pushing the Boundaries</i>
17.00 - 17.20	Vladimir Đoković <i>Gold-riboflavin hybrid nanostructures as possible photodynamic therapy agents</i>
17.20 – 17.40	Nikola Stojanović <i>Femtosecond laser spectroscopy for Exploration of Space</i>
17.40 – 17.55	Merve Ekmekçioğlu <i>Properties of Multilayer ZTO/Ag/ZTO Thin Film Electrodes Deposited by Magnetron Sputtering</i>
17.55 – 18.10	Petar Atanasijević <i>Thermoelectric temperature control of Morpho butterfly wings used for radiation sensing</i>
18.10 – 18.25	Miloš Davidović <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	Robert Loew <i>Making hot atoms interact</i>
20.30 - 20.50	Predrag Tadić <i>Photoplethysmogram as a source of biomarkers for AI-based diagnosis of heart failure</i>
20.50 - 21.10	Gulnur Aygun Ozyuzer <i>The Effect of ZTO Interlayer Between LCO and LLZO Used in All Solid State Batteries</i>
21.10 - 21.25	Mirjana Stojanović <i>Localized modes in linear flux dressed two-dimensional plus lattice</i>
21.25 – 21.40	Nataša Bon <i>The Investigation of The Central Activity and Stellar Population Parameters in Active Galactic Nuclei</i>
21.40 – 22.00	Edi Bon <i>Spectroscopic modeling of supermassive binary black hole orbits in active galactic nuclei</i>
22.00 – 22.15	Aleksander Kovačević <i>Beam modification during propagation through aqueous microalgae suspension of interest to waveguiding</i>

Tuesday, March 14th**Chairman: Ljupčo Hadžievski**

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

Chairman: Ivana Drvenica

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

Wednesday, March 15th**Chairman: Dušan Božanić**

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

Chairman: Aleksander Kovačević

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

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Autocorrelation for denoising biomedical signals

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Abstract. Photoplethysmography (PPG) has become a standard method for assessment of blood volume changes in clinical care and heart rate in home care [1]. Besides the pulse rate, PPG pulse forms carry signatures of diagnostically relevant events in cardiac cycle and can be used to estimate arterial stiffness. Extraction of these features requires removal of noise, motion artifacts and the superimposed slow varying signals, such as that from breathing, from the signal while preserving pulse morphology. However, modern filtering methods often fail to reproduce all signal features.

Here, we propose a novel noise-removal method based on autocorrelation. Autocorrelation is a well-known method used in optics, mainly for estimating the duration of ultrashort laser pulses. We used autocorrelation to remove the noise and baseline wander (BLW) from a set of bioelectrical signals, namely electrocardiogram (ECG) and PPG. These signals comprise pulses (or beats) repeated in time but with slight changes. When we record several such beats and by averaging them get a noise-free signal with distorted morphology. However, taking a few steps further, namely subtracting the average from the original signal and filtering the difference in the frequency domain, enables the noise and BLW extraction from the original signal and reproduction of a faithful noise-free signal. We tested this method on the private ECG database, where added BLW component is from public MIT-NST database, and on the private PPG signals. The results show the superiority of our approach compared to the conventional cubic spline (CSP) method.

Authors acknowledge support from the Ministry of Science RS, Grants No. 451-03-47/2023-01/200017. A. L., M.I., Lj. H. and J.P. acknowledge support by the Science Fund of the Republic of Serbia, Grant. No. 7754338, Multi-SENSor SysteM and ARTificial intelligence in service of heart failure diagnosis – SensSmart.

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