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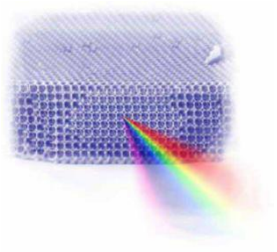
Kopaonik, March 12-15, 2023



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16th Photonics Workshop

(Conference)

16th Photonics Workshop (2023)

Book of abstracts

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Conference program

Sunday, March 12th

Chairman: Branislav Jelenković

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

Monday, March 13th

Chairman: Zoran Grujić

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

Chairman: Bratislav Marinković

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

Tuesday, March 14th

Chairman: Ljupčo Hadžievski

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

Chairman: Ivana Drvenica

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

Wednesday, March 15th

Chairman: Dušan Božanić

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

Chairman: Aleksander Kovačević

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

Table of Contents

Photoplethysmogram as a source of biomarkers for AI-based diagnosis of heart failure

Predrag Tadić[1], Jovana Petrović[2], Natalija Đorđević[1], Marija Ivanović[2], Aleksandar Lazović[2,4], Vladan Vukčević[3], Arsen Ristić[3], Ljupčo Hadžievski[2]

(1) *School of Electrical Engineering, University of Belgrade, Bulevar kralja Aleksandra 73, 11000 Belgrade, Serbia*

(2) *Vinča Institute of Nuclear Sciences, National Institute of Republic of Serbia, University of Belgrade, Mike Petrovića Alasa 12-14, 11000 Belgrade, Serbia*

(3) *School of Medicine, University of Belgrade, Dr. Subotića 8, 11000 Belgrade, Serbia*

(4) *IMTEL Komunikacije a.d., Bulevar Mihaila Pupina 165b, 11070 Belgrade, Serbia*

Contact: P. Tadić (ptadic@etf.bg.ac.rs)

Abstract. We present our progress on the "Multi-SENSor SysteM and ARTificial intelligence in service of heart failure diagnosis (SensSmart)" project, which was introduced at the last year's edition of the Workshop [1]. The goal of the SensSmart project is to enable early diagnosis of heart failure, through the development of: 1) a multi-sensor polycardiograph apparatus (PCG) that produces simultaneous acquisition of the subject's electrocardiogram (ECG), photoplethysmogram (PPG), heart sounds, and heart movements, and 2) AI-assisted analysis of the acquired signals.

This presentation is going to focus on the acquisition and processing of PPG signals. PPG is obtained by using a pulse oximeter which illuminates the skin and measures the changes in light absorption, thereby enabling the detection of blood volume changes in the vessels. Our PCG apparatus measures the blood flow through the brachial, radial, and carotid arteries. During each heartbeat, the generated waveform typically exhibits several characteristic points [2]. The magnitudes and time distances between these points are useful indicators of many cardiac conditions, including heart failure [3]. However, the inter-patient variability of the PPG waveform makes it challenging to derive simple rule-based diagnostic procedures. This has led many researchers to turn to statistical or machine learning methods for processing of PPG signals [4].

In this presentation, we give an overview of AI-based signal processing methods for PPG, and present some preliminary results and challenges in extracting features from real-world signals obtained using our PCG.

This research is supported 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. We acknowledge the support from the Ministry of Science RS, Grants No. 451-03-47/2023-01/200017 and 451-03-68/2022-14/200103.

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[2] J. Elgendi et al. *Diseases 6.1* (2018): 20.
[3] T. Besleaga et al. *IEEE Journal of Biomedical and Health Informatics* 23.6 (2018): 2409-2416.
[4] H.W. Loh et al. *Computer Methods and Programs in Biomedicine* (2022): 106677.