PROCEEDINGS OF SPIE

SPIDigitalLibrary.org/conference-proceedings-of-spie

Front Matter: Volume 8454

, "Front Matter: Volume 8454," Proc. SPIE 8454, Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2012, 845401 (7 November 2012); doi: 10.1117/12.2012565

SPIE.

Event: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2012, 2012, Wilga, Poland

PROCEEDINGS OF SPIE

Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2012

Ryszard S. Romaniuk

Editor

28 May – 3 June 2012

Wilga, Poland

Organized by

Institute of Electronic Systems, Faculty of Electronics and Information Technologies,
Warsaw University of Technology (Poland)

Sponsored by

PSP—Photonics Society of Poland • Committee of Electronics and Telecommunications
of Polish Academy of Sciences • EuCARD—European Coordination of Accelerator R&D
(CERN, EU FP7) • TIARA—Test Infrastructure and Accelerator Research Area Preparatory Phase
IEEE Poland Section • PKOpto—Polish Committee of Optoelectronics of SEP—The Association
of Polish Electrical Engineers

Published by

SPIE

Volume 8454

Proceedings of SPIE, 0277-786X, v. 8454

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2012,
edited by Ryszard S. Romaniuk, Proc. of SPIE Vol. 8454, 845401 · © 2012 SPIE
CCC code: 0277-786/12/\$18 · doi: 10.1117/12.2012565

Proc. of SPIE Vol. 8454 845401-1

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2012*, edited by Ryszard S. Romaniuk, Proceedings of SPIE Vol. 8454 (SPIE, Bellingham, WA, 2012) Article CID Number.

ISSN: 0277-786X

ISBN: 9780819491718

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA

Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445

SPIE.org

Copyright © 2012, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/12/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.

SPIDigitalLibrary.org

Paper Numbering: Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID Number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID Number.

Contents

xiii	<i>Symposium Committee</i>
xv	<i>Introduction</i>

SESSION 1	PHOTONICS APPLICATIONS AND WEB ENGINEERING, XXXTH JUBILEE WILGA 2012 SYMPOSIUM
8454 02	WILGA Photonics and Web Engineering, January 2012 [8454-101] R. S. Romaniuk, Warsaw Univ. of Technology (Poland)
8454 03	Astronomy and Space Technologies, Photonics Applications and Web Engineering, Wilga, May 2012 (Invited Paper) [8454-102] R. S. Romaniuk, Warsaw Univ. of Technology (Poland)
8454 04	Accelerator Technology and High Energy Physics Experiments, Photonics Applications and Web Engineering, Wilga, May 2012 [8454-103] R. S. Romaniuk, Warsaw Univ. of Technology (Poland)
8454 05	Photon Physics and Plasma Research, Photonics Applications and Web Engineering, Wilga, May 2012 [8454-104] R. S. Romaniuk, Warsaw Univ. of Technology (Poland)
8454 06	Optoelectronic Devices, Sensors, Communication and Multimedia, Photonics Applications and Web Engineering, Wilga, May 2012 [8454-105] R. S. Romaniuk, Warsaw Univ. of Technology (Poland)
8454 07	Biomedical, Artificial Intelligence, and DNA Computing Photonics Applications and Web Engineering, Wilga, May 2012 [8454-106] R. S. Romaniuk, Warsaw Univ. of Technology (Poland)
SESSION 2	PI OF THE SKY: A NETWORK OF ASTRONOMICAL TELESCOPES
8454 08	Analysis framework for GLORIA (Invited Paper) [8454-42] A. F. Żarnecki, L. W. Piotrowski, Univ. of Warsaw (Poland); L. Mankiewicz, Ctr. for Theoretical Physics (Poland); S. Małek, National Ctr. for Nuclear Research (Poland)
8454 09	Monitoring system of the Pi of the Sky experiment [8454-47] A. Cwiek, T. Batsch, National Ctr. for Nuclear Research (Poland); L. Mankiewicz, Ctr. for Theoretical Physics (Poland); K. Nawrocki, National Ctr. for Nuclear Research (Poland); A. F. Żarnecki, Univ. of Warsaw (Poland)

- 8454 0A **Parallax in Pi of the Sky project (Invited Paper)** [8454-53]
A. Majcher, National Ctr. for Nuclear Research (Poland); M. Sokołowski, Curtin Univ. (Australia), ARC Ctr. of Excellence for All-Sky Astrophysics (Spain), and National Ctr. for Nuclear Research (Poland); T. Batsch, National Ctr. for Nuclear Research (Poland); A. J. Castro-Tirado, Instituto de Astrofísica de Andalucía (Spain); H. Czyrkowski, Univ. of Warsaw (Poland); A. Ćwiek, National Ctr. for Nuclear Research (Poland); M. Ćwiok, R. Dąbrowski, Univ. of Warsaw (Poland); M. Jelínek, Instituto de Astrofísica de Andalucía (Spain); G. Kasprówicz, Warsaw Univ. of Technology (Poland); A. Majczyna, National Ctr. for Nuclear Research (Poland); K. Małek, Ctr. for Theoretical Physics (Poland) and Nagoya Univ. (Japan); L. Mankiewicz, Ctr. for Theoretical Physics (Poland); K. Nawrocki, National Ctr. for Nuclear Research (Poland); R. Opiela, Ctr. for Theoretical Physics (Poland); L. W. Piotrowski, Univ. of Warsaw (Poland); M. Siudek, Ctr. for Theoretical Physics (Poland); R. Wawrzaszek, Space Research Ctr. (Poland); G. Wrochna, National Ctr. for Nuclear Research (Poland); M. Zaremba, A. F. Żarnecki, Univ. of Warsaw (Poland)
- 8454 0B **Spectral analysis of the burst source 4U 1728-34** [8454-69]
A. Majczyna, National Ctr. for Nuclear Research (Poland); J. Madej, M. Należyty, Univ. of Warsaw Astronomical Observatory (Poland)
- 8454 0C **Photometric analysis of the Pi of the Sky data** [8454-70]
R. Opiela, K. Małek, L. Mankiewicz, M. Siudek, Ctr. for Theoretical Physics (Poland); M. Sokołowski, A. F. Żarnecki, Univ. of Warsaw (Poland)

SESSION 3 SATELLITE AND SPACE TECHNOLOGY

- 8454 0D **Polish-made payload for the BRIT-PL 2 satellite Heweliusz (Invited Paper)** [8454-88]
T. Zawistowski, Space Research Ctr. (Poland)
- 8454 0E **SphinX x-ray spectrophotometer (Invited Paper)** [8454-28]
M. Kowaliński, Space Research Ctr. (Poland)
- 8454 0F **Low cost amateur rotators for student's satellites and high altitude balloon application** [8454-38]
G. Woźniak, M. Stolarski, Space Research Ctr. (Poland)
- 8454 0G **Dynamic partial FPGA reconfiguration in space applications** [8454-39]
R. Graczyk, M. Stolarski, Space Research Ctr. (Poland) and Astri Polska sp.z o.o. (Poland); M.-C. Palau, Astri Polska sp.z o.o. (Poland); P. Orleanski, Space Research Ctr. (Poland)
- 8454 0H **Estimation of PW-Sat satellite orbit based on Doppler effect** [8454-41]
M. Stolarski, G. Woźniak, Space Research Ctr. (Poland) and Nicolaus Copernicus Astronomical Ctr. (Poland)
- 8454 0I **Versatile self-reconfigurable digital processing platform for satellite and aerospace applications** [8454-50]
A. Cichocki, Warsaw Univ. of Technology (Poland) and Space Research Ctr. (Poland); W. Nowosielski, P. Orleanski, Space Research Ctr. (Poland)

- 8454 OJ **Low cost and high performance on-board computer for picosatellite** [8454-67]
T. Rajkowski, R. Graczyk, Astri Polska sp.z o.o. (Poland), Space Research Ctr. (Poland), and Warsaw Univ. of Technology (Poland); M. C. Palau, Astri Polska sp.z o.o. (Poland); P. Orleański, Space Research Ctr. (Poland)
- 8454 OK **Instrument data processing unit for spectrometer/telescope for imaging x-rays (STIX) (Invited Paper)** [8454-89]
K. R. Skup, A. Cichocki, R. Graczyk, M. Michalska, M. Mosdorf, W. Nowosielski, Space Research Ctr. (Poland); P. Orleański, Space Research Ctr. (Poland) and Univ. of Applied Sciences and Arts Northwestern Switzerland (Switzerland); A. Przepiórka, K. Seweryn, M. Stolarski, M. Winkler, J. Sylwester, M. Kowalinski, Space Research Ctr. (Poland); T. Mrozek, Space Research Ctr. (Poland) and Univ. of Wrocław (Poland); P. Podgorski, Space Research Ctr. (Poland); A. O. Benz, S. Krucker, G. J. Hurford, N. G. Arnold, Univ. of Applied Sciences and Arts Northwestern Switzerland (Switzerland); H. Önele, Leibniz-Institut für Astrophysik Potsdam (Germany); A. Meuris, O. Limousin, CEA Saclay (France); O. Grimm, ETH Zürich (Switzerland)

SESSION 4 HIGH ENERGY PHYSICS EXPERIMENTS

- 8454 OL **Detector control system for the ATLAS Transition Radiation Tracker: architecture and development techniques (Invited Paper)** [8454-71]
E. Banaś, Z. Hajduk, J. Olszowska, The Henryk Niewodniczański Institute of Nuclear Physics (Poland)
- 8454 OM **Fast ADC based multichannel acquisition system for the GEM detector (Invited Paper)** [8454-48]
G. Kaspruwicz, Warsaw Univ. of Technology (Poland); T. Czarski, M. Chernyshova, Institute of Plasma Physics and Laser Microfusion (Poland); W. Dominik, Univ. of Warsaw (Poland); K. Jakubowska, L. Karpinski, Institute of Plasma Physics and Laser Microfusion (Poland); K. Kierzkowski, Univ. of Warsaw (Poland); K. Pożniak, Warsaw Univ. of Technology (Poland); J. Rządkiewicz, M. Scholz, Institute of Plasma Physics and Laser Microfusion (Poland); W. Zabolotny, Warsaw Univ. of Technology (Poland)
- 8454 ON **Implementation of PCI Express bus communication for FPGA-based data acquisition system** [8454-62]
A. Byszuk, J. Kołodziejewski, G. Kaspruwicz, K. Pożniak, W. M. Zabolotny, Warsaw Univ. of Technology (Poland)
- 8454 OO **Accelerator science and technology in Europe: EuCARD 2012** [8454-107]
R. S. Romaniuk, Warsaw Univ. of Technology (Poland)
- 8454 OP **Heavy stable charged particles search by novel pattern comparator processor** [8454-73]
A. Zagożdżńska, K. T. Pożniak, R. Romaniuk, Warsaw Univ. of Technology (Poland)
- 8454 OQ **Simulation and measurement of super-high density micropixel avalanche photodiodes** [8454-45]
A. Rychter, Warsaw Univ. of Technology (Poland)

SESSION 5 COMMUNICATIONS AND MULTIMEDIA TECHNOLOGY

- 8454 OR **Particularities of design and application of model-based simulation research bench to analysis of adaptive feedback communication systems (Invited Paper)** [8454-75]
I. Zaitsev, A. Platonov, Warsaw Univ. of Technology (Poland)
- 8454 OS **Development of embedded PC and FPGA based systems with virtual hardware** [8454-6]
W. M. Zabołotny, Warsaw Univ. of Technology (Poland)
- 8454 OT **Low cost USB-local bus interface for FPGA based systems** [8454-7]
W. M. Zabołotny, G. Kasprowicz, Warsaw Univ. of Technology (Poland)
- 8454 OU **Huffman coding in advanced audio coding standard** [8454-24]
G. Brzuchalski, Warsaw Univ. of Technology (Poland)
- 8454 OV **Stereo matching with superpixels** [8454-25]
M. Roszkowski, Warsaw Univ. of Technology (Poland)
- 8454 OW **An FPGA architecture for MPEG-2 TS demultiplexer** [8454-33]
A. Abramowski, Warsaw Univ. of Technology (Poland)
- 8454 OX **Bitrate estimation for P-frames in rho domain** [8454-34]
M. Wieczorek, Warsaw Univ. of Technology (Poland)
- 8454 OY **Measuring and minimizing interrupt latency in Linux-based embedded systems** [8454-60]
R. Rybaniec, Institute of Aviation (Poland); P. Z. Wieczorek, Warsaw Univ. of Technology (Poland)
- 8454 OZ **Improvement of intelligent cyclic ADC resolution by randomization of DAC INL errors** [8454-74]
Ł. Małkiewicz, Warsaw Univ. of Technology (Poland)

SESSION 6 OPTOELECTRONIC TECHNOLOGIES, COMPONENTS, DEVICES, AND SYSTEMS

- 8454 10 **Nonlinear light propagation in photonic crystal fibers infiltrated with liquid crystalline materials (Invited Paper)** [8454-21]
K. Orzechowski, K. A. Rutkowska, Warsaw Univ. of Technology (Poland)
- 8454 11 **Time efficiency of the electric tuning of index-guiding photonic liquid crystal fiber** [8454-59]
A. Siarkowska, S. Ertman, T. R. Wolinski, Warsaw Univ. of Technology (Poland)
- 8454 12 **Incoherent optical MIMO transmission over multimode fibers** [8454-26]
M. Kowalczyk, Warsaw Univ. of Technology (Poland)
- 8454 13 **Enhancement of pumping efficiency in 8-core double-clad optical fiber doped with Nd³⁺** [8454-22]
M. Kochanowicz, D. Dorosz, J. Żmojda, P. Miluski, J. Dorosz, Białystok Univ. of Technology (Poland)

- 8454 14 **Yb³⁺/Ho³⁺-codoped antimony-silicate optical fiber** [8454-30]
J. Żmojda, D. Dorosz, M. Kochanowicz, P. Miluski, J. Dorosz, Białystok Univ. of Technology (Poland)
- 8454 15 **Active materials to enhance the efficiency of PV systems** [8454-31]
M. Wyrwas, J. Żmojda, D. Dorosz, M. Kochanowicz, K. Iwanowicz, T. Ragin, W. Mazerski, J. Dorosz, Białystok Univ. of Technology (Poland)
- 8454 16 **Analysis of upconversion processes in germanate and tellurite glasses codoped with Yb³⁺/Ho³⁺** [8454-32]
K. Iwanowicz, T. Ragiń, M. Wyrwas, J. Żmojda, M. Kochanowicz, D. Dorosz, J. Dorosz, Białystok Univ. of Technology (Poland)
- 8454 17 **Capillary optical fibre sensor for measurement of dry weight in liquid sugar** [8454-49]
P. Miluski, Białystok Univ. of Technology (Poland)
- 8454 18 **Laser technology and applications 2012: a preview** [8454-111]
J. Gajda, West Pomeranian Univ. of Technology in Szczecin (Poland); R. S. Romaniuk, Warsaw Univ. of Technology (Poland)
- 8454 19 **Optical testing of air slit** [8454-97]
D. Kuźma, Ł. Dubiel, T. Więcek, Rzeszów Univ. of Technology (Poland)
- 8454 1A **Atlas of copper standard spectrum for the grating 1300 lines/mm mounted at PGS-2 spectrograph** [8454-96]
J. Domin, J. Sadowska, Rzeszów Univ. of Technology (Poland)

SESSION 7 MATERIALS AND TECHNOLOGIES

- 8454 1B **Method of making electric connections using inkjet printing painting on LTCC substrates (Invited Paper)** [8454-4]
K. Futera, Tele and Radio Research Institute (Poland) and Warsaw Univ. of Technology (Poland); M. Jakubowska, Warsaw Univ. of Technology (Poland); G. Koziół, A. Araźna, K. Janeczek, Tele and Radio Research Institute (Poland)
- 8454 1C **Characterization of polymer silver pastes for screen printed flexible RFID antennas** [8454-43]
K. Janeczek, Tele and Radio Research Institute (Poland); M. Jakubowska, Institute of Electronic Materials Technology (Poland) and Warsaw Univ. of Technology (Poland); K. Futera, Tele and Radio Research Institute (Poland); A. Młodziak, Institute of Electronic Materials Technology (Poland); G. Koziół, A. Araźna, Tele and Radio Research Institute (Poland)
- 8454 1D **Composites with increased thermal conductivity: FEM analysis** [8454-81]
K. Gułkowska, Warsaw Univ. of Technology (Poland)
- 8454 1E **Screen printed, transparent, and flexible electrodes based on graphene nanoplatelet pastes** [8454-95]
G. Wróblewski, D. Janczak, Warsaw Univ. of Technology (Poland)

SESSION 8 COMPONENTS AND SYSTEMS MODELING

- 8454 1F **A study of the parallel algorithm for large-scale DC simulation of nonlinear systems (Invited Paper)** [8454-10]
D. E. Cortés Udave, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); J. Ogrodzki, Warsaw Univ. of Technology (Poland); M. A. Gutiérrez de Anda, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico)
- 8454 1G **DC simulator of large-scale nonlinear systems for parallel processors** [8454-11]
D. E. Cortés Udave, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); J. Ogrodzki, Warsaw Univ. of Technology (Poland); M. Gutiérrez de Anda, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico)
- 8454 1H **Benchmarking a derivative-free minimax optimizer for EM design (Invited Paper)** [8454-12]
L. J. Opalski, Warsaw Univ. of Technology (Poland)
- 8454 1I **A new approach to improvement of pipeline A/D converters characteristics** [8454-36]
K. Jędrzejewski, Warsaw Univ. of Technology (Poland)
- 8454 1J **Properties of digital 1/3-octave filters implemented according to ANSI S1.11** [8454-40]
A. Geras, T. Starecki, Warsaw Univ. of Technology (Poland)
- 8454 1K **Transmission line model with skin effect for generic circuit simulator** [8454-8]
K. Opalska, Warsaw Univ. of Technology (Poland)
- 8454 1L **Accelerating artificial intelligence with reconfigurable computing** [8454-18]
R. Cieszewski, Warsaw Univ. of Technology (Poland)
- 8454 1M **Application of the least squares constant modulus algorithm for multipath removal in the FM signal** [8454-112]
Z. Gajo, M. Linczuk, Warsaw Univ. of Technology (Poland)

SESSION 9 BIOMEDICAL AND DNA COMPUTING

- 8454 1N **Simplified model of mean double step (MDS) in human body movement (Invited Paper)** [8454-16]
J. J. Dusza, Warsaw Univ. of Technology (Poland); Z. M. Wawrzyniak, Warsaw Univ. of Technology (Poland) and Medical Univ. of Warsaw (Poland); C. F. Mugarra González, Univ. of Valencia (Spain)
- 8454 1O **Data management and quality assurance in a population study (Invited Paper)** [8454-98]
Z. M. Wawrzyniak, Warsaw Univ. of Technology (Poland) and Medical Univ. of Warsaw (Poland); D. Paczesny, Warsaw Univ. of Technology (Poland)
- 8454 1P **Reverse translations of gene-coding DNA sequences using hidden Markov models** [8454-27]
T. Kaczynski, R. Nowak, Warsaw Univ. of Technology (Poland)

- 8454 1Q **EEG signal classification based on artificial neural networks and amplitude spectra features** [8454-29]
K. Chojnowski, J. Frączek, Warsaw Univ. of Technology (Poland)
- 8454 1R **Classification of RNA secondary structure** [8454-35]
P. Róż, R. Nowak, Warsaw Univ. of Technology (Poland)
- 8454 1S **Heuristics for haplotype frequency estimation with a large number of analyzed loci** [8454-44]
M. Nowotka, R. Nowak, Warsaw Univ. of Technology (Poland)
- 8454 1T **Impedance pneumography: Is it possible?** [8454-55]
M. Młyńczak, Warsaw Univ. of Technology (Poland); G. Cybulski, Warsaw Univ. of Technology (Poland) and Mossakowski Medical Research Ctr. (Poland)
- 8454 1U **Optimization of short amino acid sequences classifier** [8454-72]
A. Barcz, Z. Szymański, Warsaw Univ. of Technology (Poland)
- 8454 1V **Design guidelines for an umbilical cord blood stem cell therapy quality assessment model** [8454-78]
W. S. Januszewski, K. Michatek, Warsaw Univ. of Technology (Poland); O. Yagensky, Jagiellonian Univ. in Krakow (Poland); M. Wardzińska, Univ. of Warsaw (Poland)
- 8454 1W **Feature selection from short amino acid sequences in phosphorylation prediction problem** [8454-90]
J. Węclawski, S. Jankowski, Z. Szymański, Warsaw Univ. of Technology (Poland)
- 8454 1X **On data modeling for neurological application** [8454-91]
K. Woźniak, J. Mulawka, Warsaw Univ. of Technology (Poland)
- 8454 1Y **Development of genome viewer (Web Omics Viewer) for managing databases of cucumber genome** [8454-66]
M. Wojcieszek, Warsaw Univ. of Life Sciences (Poland); P. Róż, Warsaw Univ. of Technology (Poland); M. Pawełkowicz, Warsaw Univ. of Life Sciences (Poland); R. Nowak, Warsaw Univ. of Technology (Poland); Z. Przybecki, Warsaw Univ. of Life Sciences (Poland)

SESSION 10 AIRBORNE APPLICATIONS OF COMPUTATIONAL INTELLIGENCE

- 8454 1Z **A new bio-inspired decision chain for UAV sense-and-avoid applications (Invited Paper)** [8454-79]
P. Fallavollita, Univ. degli Studi di Roma La Sapienza (Italy) and Humanitarian Demining Lab. (Italy); F. Cimini, Univ. degli Studi di Roma La Sapienza (Italy); M. Balsi, S. Esposito, Univ. degli Studi di Roma La Sapienza (Italy) and Humanitarian Demining Lab. (Italy); S. Jankowski, Warsaw Univ. of Technology (Poland)
- 8454 20 **Environment model for unmanned flying vehicles based on simulated radar data** [8454-77]
M. Pawłowski, Z. Szymański, Warsaw Univ. of Technology (Poland)
- 8454 21 **Unmanned aerial vehicle 3D flight simulator by vector field histogram** [8454-93]
S. Tor, S. Jankowski, Warsaw Univ. of Technology (Poland)

8454 22 **Reconstruction of environment model by using radar vector field histograms** [8454-94]
Z. Szymański, S. Jankowski, J. Szczyrek, Warsaw Univ. of Technology (Poland)

8454 23 **Optimization of support vector machine hyperparameters using radius/margin bound**
[8454-100]
S. Jankowski, W. Sadurski, Warsaw Univ. of Technology (Poland)

SESSION 11 ARTIFICIAL INTELLIGENCE, CRYPTOGRAPHY, SOFTWARE, AND ONTOLOGICAL ITC SYSTEMS

8454 24 **A proposal to describe a phenomenon of expanding language (Invited Paper)** [8454-57]
K. Swietorzecka, Cardinal Stefan Wyszyński Univ. in Warsaw (Poland)

8454 25 **Implementation of inference calculus in the PowerLoom environment** [8454-15]
M. F. Wachulski, J. J. Mulawka, Warsaw Univ. of Technology (Poland); E. Nieznański, Łazarski Univ. (Poland)

8454 26 **On a categorial aspect of knowledge representation** [8454-37]
E. Tataj, J. Mulawka, Warsaw Univ. of Technology (Poland); E. Nieznański, Cardinal Stefan Wyszyński Univ. in Warsaw (Poland)

8454 27 **On proving in epistemic logic** [8454-46]
D. Grzegorzczak, J. J. Mulawka, Warsaw Univ. of Technology (Poland); E. Nieznański, Cardinal Stefan Wyszyński Univ. in Warsaw (Poland)

8454 28 **The philosophical backgrounds of formal concept analysis** [8454-51]
M. Porwolik, Cardinal Stefan Wyszyński Univ. in Warsaw (Poland)

8454 29 **Interfacing Clojure with Pogamut 3 platform** [8454-58]
M. Gołtuński, P. Wąsiewicz, Warsaw Univ. of Technology (Poland)

8454 2A **Modeling intelligent agent beliefs in a card game scenario** [8454-68]
M. Gołtuński, Warsaw Univ. of Technology (Poland); R. Tomanek, Cardinal Stefan Wyszyński Univ. in Warsaw (Poland); P. Wąsiewicz, Warsaw Univ. of Technology (Poland)

8454 2B **Inconsistency and its automated proving** [8454-76]
P. Orzeszek, Cardinal Stefan Wyszyński Univ. in Warsaw (Poland)

8454 2C **A plug-in to Eclipse for VHDL source codes: functionalities** [8454-108]
B. Niton, K. T. Poźniak, R. S. Romaniuk, Warsaw Univ. of Technology (Poland)

8454 2D **Cryptographically secure hardware random number generator dedicated for distributed measurement and control systems** [8454-3]
P. Czernik, Warsaw Univ. of Technology (Poland)

8454 2E **Modular multiplication in $GF(p)$ for public-key cryptography** [8454-17]
J. Olszyna, Warsaw Univ. of Technology (Poland)

Author Index

Symposium Committees

Symposia Steering Committee

Andrzej W. Domański, Warsaw University of Technology (Poland)
Jan Dorosz, Białystok University of Technology (Poland)
Leszek Jaroszewicz, Military University of Technology, Warsaw (Poland)
Jerzy Klamka, Elektronika, Association of Polish Electrical Engineers (Poland)
Lech Mankiewicz, Mikołaj Kopernik Astronomical Center, PAS (Poland)
Ryszard S. Romaniuk, Warsaw University of Technology (Poland)
Jan Dorosz, Białystok University of Technology (Poland)
Tomasz R. Woliński, Warsaw University of Technology (Poland)
Wiesław L. Woliński, Warsaw University of Technology (Poland)
Waldemar Wójcik, Lublin University of Technology (Poland)
Grzegorz Wrochna, National Center for Nuclear Research (Poland)

2012 Symposium Chair

Ryszard S. Romaniuk, Warsaw University of Technology (Poland)

Symposium Committee

Tomasz Adamski, Warsaw University of Technology (Poland)
Michał Borecki, Warsaw University of Technology (Poland)
Dominik Dorosz, Białystok University of Technology (Poland)
Zbigniew Gołębiowski, National Center for Nuclear Research (Poland)
Antoni Grzanka, Warsaw University of Technology (Poland)
Stanisław Jankowski, Warsaw University of Technology (Poland)
Mirośław Karpierz, Warsaw University of Technology (Poland)
Grzegorz Kasprowicz, Warsaw University of Technology (Poland)
Maciej Linczuk, Warsaw University of Technology (Poland)
Lech Mankiewicz, Center for Theoretical Physics, Polish Academy of Sciences (Poland)
Tadeusz Morawski, Warsaw University of Technology (Poland)
Jan J. Mulawka, Warsaw University of Technology (Poland)
Robert Nietubyć, National Center for Nuclear Research (Poland)
Jan Ogrodzki, Warsaw University of Technology (Poland)
Leszek Opalski, Warsaw University of Technology (Poland)
Anatoli Piatonow, Warsaw University of Technology (Poland)
Krzysztof T. Poźniak, Warsaw University of Technology (Poland)
Michał Ramotowski, Warsaw University of Technology (Poland)
Władysław Skarbek, Warsaw University of Technology (Poland)
Wojciech M. Zabołotny, Warsaw University of Technology (Poland)

Agnieszka Zagoździńska, Warsaw University of Technology (Poland)
Filip A. Żarnecki, Warsaw University (Poland)

Session Chairs

- 1 Photonics Applications and Web Engineering, XXXth Jubilee Wilga 2012 Symposium
Ryszard S. Romaniuk, Warsaw University of Technology (Poland)
- 2 Pi of the Sky – A Network of Astronomical Telescopes
Filip A. Żarnecki, Warsaw University (Poland)
- 3 Satellite and Space Technology
Piotr Orleański, Space Research Center, Polish Academy of Sciences (Poland)
- 4 High Energy Physics Experiments
Krzysztof T. Poźniak, Warsaw University of Technology (Poland)
- 5 Communications and Multimedia Technology
Władysław Skarbek, Warsaw University of Technology (Poland)
- 6 Optoelectronic Technologies, Components, Devices, and Systems
Michał Borecki, Warsaw University of Technology (Poland)
- 7 Materials and Technologies
Małgorzata Jakubowska, Warsaw University of Technology (Poland)
- 8 Components and System Modeling
Leszek Opalski, Warsaw University of Technology (Poland)
Jan Ogrodzki, Warsaw University of Technology (Poland)
- 9 Biomedical and DNA Computing
Antoni Grzanka, Warsaw University of Technology (Poland)
- 10 Airborne Applications of Computational Intelligence
Stanisław Jankowski, Warsaw University of Technology (Poland)
- 11 Artificial Intelligence, Cryptography, Software and Ontological ITC Systems
Jan J. Mulawka, Warsaw University of Technology (Poland)
- 12 WILGA 2012 SPIE–PSP Best Student Paper Awards
Maciej Linczuk, Warsaw University of Technology (Poland)
Ryszard Kossowski, Warsaw University of Technology (Poland)
Michał Ramotowski, Warsaw University of Technology (Poland)

Introduction

The SPIE-IEEE-PSP WILGA Symposium [wilga.ise.pw.edu.pl] is a kind of international Forum of Young Science in Photonics, Advanced Electronics, and Internet Engineering. It is organized twice a year under the eminent patronage of two big international engineering institutions, SPIE [www.spie.org/] and IEEE [www.ieee.org/] and their Polish Counterparts: PSP—Photonics Society of Poland [www.photonics.pl/], successor of Polish Chapter of SPIE [www.spie.pl/] and IEEE Poland Section [www.ieee.pl], with participation of IEEE R8 [ewh.ieee.org/reg/8/sac/cms]. The patrons of the symposium are: PAS—Polish Academy of Science (The Committee on Electronics and Telecommunication) [keit.pan.pl], Association of Polish Electrical Engineers (SEP) [www.sep.com.pl], Polish Committee of Optoelectronics SEP [pkopto.ise.pw.edu.pl], Warsaw University of Technology [www.pw.edu.pl], Institute of Electronic Systems [www.ise.pw.edu.pl].

WILGA Organizers: The Symposium is organized by a group of devoted young people - photonics, mechatronics, and electronics researchers - gathered in the PERG/ELHEP Research Group of the Institute of Electronic Systems at the Faculty of Electronics and Information Technology of WUT. Most of these young researchers are active members of PSP, SEP, SPIE, OSA, and IEEE. The symposium is diligently done by young researchers for young fellow researchers and the main aim is to have a lot of fun and to learn a lot.

WILGA Publications: The WILGA Symposium publishes its papers in the following proceedings series, technical and peer-reviewed journals: Proceedings of SPIE, since 2002; IEEE eXplore, Internet publication data base; Photonics Letters of Poland, since 2009; Elektronika, SEP Journal, since 1998; JET—Intl. Journal of Electronics and Telecommunications, PAS.

WILGA Proceedings of SPIE: There has been a long tradition of WILGA publishing its works in the Proceedings of SPIE. This volume is the 12th published of the WILGA-SPIE series. All of the WILGA-SPIE volume series contain more than 1000 papers; all WILGA Symposiums published more than 2500 papers with around 5000 participants. This is an extraordinary achievement for a modest symposium oriented solely on young researchers. No one event of similar character could compare to this achievement. This success was only possible due to big involvement of young researchers in their work. The following WILGA Proc. SPIE were published: Wilga 2002 – Proc. SPIE 5125; Wilga 2003 – Proc. SPIE 5484; Wilga 2004 – Proc. SPIE 5775; Wilga 2005 bis – Proc. SPIE 5948; Wilga 2005 – Proc. SPIE 6159; Wilga 2006 – Proc. SPIE 6347; Wilga 2007 – Proc. SPIE 6937; Wilga 2008 – Proc. SPIE 7124; Wilga 2009 – Proc. SPIE 7502; Wilga 2010 – Proc. SPIE 7745; WILGA 2011 – Proc. SPIE 8008; WILGA 2012 – Proc. SPIE 8454.

SPIE Poland 2005: The SPIE Poland meetings in 2005 were very special because then the Polish Chapter of SPIE (predecessor of Photonics Society of Poland) hosted together with SPIE and some other regional SPIE Chapters, the SPIE Warsaw Congress on Optics and Optoelectronics – SPIE COO Warsaw 2005. WILGA 2005 Symposium was split to two parts – one held usually in WILGA and the second jointly with the COO'05.

WILGA ways and topics: The official language of the symposium is English. Peer reviewed papers are published in a renowned, internationally recognized series called the Proceedings of SPIE. The symposium is designed mainly for Ph.D., M.Sc., and B.Sc. students (from physics, electronics and mechatronics, as well as material research) and their tutors/mentors. WILGA has a number of main topical tracks. Historically, the first one was Photonics and Web Engineering. Generally, WILGA embraces advanced photonic, mechatronic and electronic systems, in the following aspects: theory, modeling, algorithms, simulations, emulations, design, hardware, software, hardware-software interaction and integration, measurements, testing, commissioning and exploitation. WILGA also addresses new research tendencies like 3D photonics and electronics design, micro- and nano-systems, material engineering including meta-materials.

Topical sessions are organized by leading experts. Sessions usually begin with current tutorials and are filled with contributed papers by students and young researchers. One of the most important session tracks in WILGA are photonics applications and systems for superconductive accelerator (and free electron laser) technology and high energy physics experiments. We invite warmly students, young researchers and their tutors to participate in WILGA.

WILGA XXXth Jubilee Symposium: The WILGA 2012 January Edition was held on 26–29 January 2012 at WUT's FE&IT. WILGA 2012, the May edition, was held on 28 May–2 June 2012 in a resort owned by Warsaw University of Technology. More than 300 presentations were delivered during both editions of Wilga, covering a broad area of photonics applications and web engineering. Nearly 350 persons participated. An exceptionally efficient chair of the Organization Committee of WILGA 20121 was traditionally Dr. Maciek Linczuk [M.Linczuk@elka.pw.edu.pl].

The working research Sessions of 30th WILGA 2012 were: general photonics, optical fiber technology, optical communications, optoelectronics, applications of optical fibers, integration of electronics, photonics and mechatronics, distributed measurement systems, LHC and CMS at CERN, JET and ITER tokamaks, optics and optoelectronics for astronomy, fundamentals of FPGA-DSP systems, object oriented design of hardware, terabit optical data links, software-hardware co-design, biomedical engineering, computational intelligence of advanced systems, development of photonics and electronics in Europe and Poland, radar technology, terahertz photonics, free electron lasers, E-XFEL and POLFEL lasers, EuCARD – European Coordination of Accelerator Research and Development, TIARA, etc.

WILGA offsprings: The WILGA Symposium gave birth to a few topical meetings and conferences which then struck out on their own. These include students regional meetings (Opole, Wrocław, Kielce, Białystok, Lublin, Toruń and others), of SPIE student chapters, IEEE student branches, but also stand-alone conferences. Some of these meetings are still held periodically with Wilga, while some of them gained complete independence. WILGA is very proud of this sort of partnership, since the very good idea of WILGA is proliferating elsewhere. One of such meetings is, now fully nondependent, SPS – Signal Processing Symposium which started at Wilga in 2003.

SPIE – PSP WILGA 2013: The organizers of WILGA 2012 Symposium, to be held on 27 May – 02 June 2013, warmly invite interested young researchers and students in photonics and related fields to participate in this exceptional and very friendly research event oriented to host young researchers from Poland and all over Europe.

References

1. WILGA 2002: R.S.Romaniuk, K.T.Poźniak (editors), Proc. SPIE 5125; Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2002; ISBN 9780819449856; 472 pages, 55 papers; (2003)
2. WILGA 2003: R.S.Romaniuk (editor), Proc.SPIE 5484; Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2003; ISBN 9780819454157; 734 pages, 94 papers; (2004)
3. WILGA 2004: R.S.Romaniuk (editor). Proc. SPIE 5775; Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2005; ISBN 9780819457561; 710 pages, 92 papers; (2005)
4. WILGA 2005 bis: R.S.Romaniuk, S.Simrock, V.M.Lutkovski (editors), Proc. SPIE 5948, Photonics Applications in Industry and Research 2005; ISBN 9780819459558; 864 pages, 89 papers; (2005)
5. WILGA 2005: R.S.Romaniuk (editor), Proc. SPIE 6159; Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2005; ISBN 9780819462114; 1244 pages, 172 papers; (2006)
6. WILGA 2006: R.S.Romaniuk (editor), Proc. SPIE 6347; Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2006; ISBN 9780819464316; 874 pages, 111 papers; (2006)
7. WILGA 2007: R.S.Romaniuk (editor), Proc. SPIE 6937; Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2007; ISBN 9780819471246; 1274 pages, 152 papers; (2008)
8. WILGA 2008: R.S.Romaniuk, T.R.Woliński (editors), Proc. SPIE 7124; Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2008; ISBN 9780819473585; 312 pages, 35 papers; (2008)
9. WILGA 2009: R.S.Romaniuk, K.S.Kulpa (editors), Proc. SPIE 7502; Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2009; ISBN 9780819478139; 786 pages, 100 papers; (2009)
10. WILGA 2010: R.S.Romaniuk (editor), Proc. SPIE 7745; Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2010; ISBN 9780819464316; 650 pages, 73 papers; (2010)
11. WILGA 2011: R.S.Romaniuk (editor), Proc. SPIE 8008; Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments 2011; ISBN 9780819464316; 500 pages, 70 papers; (2011)

12. WILGA 2012: R.S.Romaniuk (editor), Proc. SPIE 8454; Photonics Applications in Astronomy, Communication, Industry, and High Energy Physics Experiments 2012: ISBN 9780819491718; 600 pages, 90 papers (2012)
13. J.Dorosz, R.Romaniuk, The role of regional developments in optical fiber technology and photonics, Proc. SPIE 5028, 2003, pp.xi-xii
14. R.Romaniuk, K.Pozniak, Foreword: Photonics and electronics for astronomy and high energy physics experiments in Poland, Proc.SPIE 5125, 2002, pp.xiii-xxxiv
15. W.Woliński, Z.Jankiewicz, R.Romaniuk, Proceedings of SPIE – The International Society for Optical Engineering: Introduction, Proc. SPIE 5230, 2003, pp.ix-x
16. R.Romaniuk, Proceedings of SPIE – The International Society for Optical Engineering: Introduction, Proc. SPIE 5775, 2005, pp.xxi-xxvii
17. R.Romaniuk, Proceedings of SPIE – The International Society for Optical Engineering: Introduction, Proc. SPIE 5848, 2005, pp.xvii-xxi
18. R.Romaniuk, Proceedings of SPIE – The International Society for Optical Engineering: Introduction, Proc. SPIE 6347, 2006, pp.xxix-xxxii
19. W.Wolinski, Z.Jankiewicz, R.Romaniuk, Proceedings of SPIE – The International Society for Optical Engineering: Introduction, Proc. SPIE 6598, 2007, pp.ix-xii
20. R.Romaniuk, Proceedings of SPIE – The International Society for Optical Engineering: Introduction, Proc. SPIE 6937, 2008, pp.xxix-xli
21. W.Woliński, Z.Jankiewicz, R.Romaniuk, Proceedings of SPIE – The International Society for Optical Engineering: Introduction, Proc. SPIE 5229, 2003, pp.xi-xii
22. J.Dorosz, R.Romaniuk, T.Wolinski, Eleventh conference on optical fibers and their applications, Proc. SPIE 7120, 2008, pp.xiii-xv
23. R.Romaniuk, K.Kulpa, Photonics applications in Astronomy, Communications Industry and High-Energy Physics Experiments 2009: Introduction, Proc. SPIE 7502, 2009, art no 750201, pp.xxiii-xxiv
24. R.Romaniuk, Photonics and Web Engineering in Poland, WILGA 2009, Proc. SPIE 7502, 2009, art no. 750202
25. R.Romaniuk, WILGA Symposium on photonics applications, Photonics Letters of Poland 1 (2), 2009, pp.46-48
26. R.S.Romaniuk, Wilga 2010, Photonics Applications, Proc.SPIE 7745, pp.xiii-xviii, 2010
27. R.S.Romaniuk, Wilga 2011, Photonics Applications, Proc.SPIE 8008, pp.xii-xviii, 2011
28. R.S.Romaniuk, Wilga 2012, Photonics Applications, Proc.SPIE 8454, pp.vii-x, 2012

Ryszard S. Romaniuk