INSTITUTE OF RADIOELECTRONICS

WARSAW UNIVERSITY OF TECHNOLOGY

FACULTY OF ELECTRONICS AND INFORMATION TECHNOLOGY

ANNUAL REPORT

2014

Warsaw, January 2015

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From the Director

Welcome to the 2014 edition of the Annual Report issued by the Institute of Radioelectronics!

It was the year of various challenges both to our Institute and fellow co-workers. However, it can be said that most of them have been faced with great success. First of all, large resources allocated to research and development within 2007-2013 European budget are about to end, while the Horizon 2020 still pose substantial difficulties to vast majority of academic society and to Polish authorities involved in the amendment of domestic regulations that should be quickly adapted to new circumstances. Despite such unfavorable conditions, annual turnover reaching almost 2.2 million Euros has beaten all previous records ever scored at the Institute, confirming widely recognized competence and excellence of our staff. Apparently, one of essential keys to that success, that should be emphasized and promoted in the future, is diversity of activities of many of our colleagues, spanning from fundamental science to commercial and military contracts mostly focused on applied engineering. Therefore, in the upcoming year Institute's authorities will be still strongly supporting multidisciplinary research, which is opening new perspectives and long-term cooperation with strong players on domestic and international market.

Another challenging issue that has recently come up is the evaluation of academics, which on one hand will create additional competition between co-workers but, on the other hand, may contribute to better quality of ongoing research and its wider dissemination in peer-reviewed international journals. In principle, annual figures confirm that we are heading in the right direction as the total number of publications year-by-year and those indexed in JCR-ICI list have significantly increased. We should definitely keep it up in 2015! Nevertheless, it seems that the most valuable appraisal to all academics is that issued voluntarily by students as it gives a real measure of one's attitude and willingness to share its knowledge in an interesting and comprehensive form. Therefore, it is a real pleasure to see two Golden Chalk awards granted by the Faculty students to our dear colleagues, Dr. Jerzy Kołakowski and Dr. Jacek Naruniec. It can be believed that such successful events may additionally contribute to the increase of talented students choosing our Institute for graduate studies. It should be also noted that several colleagues received individual and team awards of the Rector and there has been a few Medals handed for long-lasting service at our University. Two members of our authorities have also received highly prestigious awards, namely, Medal of National Education Committee for Prof. Wiesław Winiecki and Prof. Krzysztof Zaremba. Moreover, three of our younger colleagues, Dr. Piotr Bilski, Dr. Waldemar Smolik, and Dr. Kajetana Snopek, have been awarded for their meaningful expertise with D.Sc. degrees, while 5 students have received their Ph.D diploma.

I want to thank all the colleagues working at the Institute of Radioelectronics for their deep involvement, hard work and dedicate service. I also would like to express a deep gratitude to our Grantors, Sponsors, Co-operators and all the Friends of the Institute without whom we would have not been able to achieve our aims

Warsaw, January 2015

Professor Józef Modelski

Classification of publications presented in this Report
is in accordance with the rules in force in 2014

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1. GENERAL INFORMATION

1.1. Mission of the Institute

In defining its mission, the Institute of Radioelectronics is amenable to contemporary needs of academia, industry, and society. Therefore, it aims at the three measurable objectives: to provide teaching of societal relevance; to seek excellence in scientific research; and to run projects meeting the international standards. Technically, we focus on the well-defined specializations: radiocommunications, multimedia, biomedical engineering, and nuclear electronics. These are very well perceived by our students and partners in national and international activities.

As educators, our staff performs sterling work and exhibit immense stamina. The effects are directly measurable in terms of quality and numbers of supervised diplomas. Our graduates prove competitive on the demanding job market in Poland and abroad. They find employment in telecommunication services, mobile communications, information technology, television, and also in public services. We reach further into these sectors through the successful scheme of continuing education. The offer of courses including Radiocommunications and Multimedia Technologies attracts an increasing number of participants.

As researchers, we are faithful to the highest standards of the Faculty and the University. We also feel quite unique due to an extremely broad spectrum of addressed subjects, which comprise:

- electromagnetic and acoustic field theory, acoustic and electromagnetic wave generation and propagation,
- signal theory, processing, coding, transmission, with regard to electronic, electroacoustic, and TV signals,
- radio transmitting and receiving,
- radiocommunication terrestrial and satellite systems,
- physical phenomena in radio engineering, acoustic, nuclear engineering, and medical systems,
- biomedical signal analysis, medical imaging, medical informatics,
- X-ray, MR, and emission tomography,
- detection and spectrometry of radiation,
- analysis and synthesis of electronic systems,
- intelligent multimedia systems and multimedia converged (video, data, and voice),
- measuring methods and systems,
- analysis, measurement, and estimation of sound and image distortion.

It is also our ambition to implement the new scientific knowledge into a good engineering practice. The Institute covers the full process of technological development, from innovative ideas up to the construction of prototypes. The products are applicable in: radio communication systems, radio-location antennae, television equipment, radio-monitoring systems, high-efficiency energy sources, high-power radio engineering devices, equipment for time and frequency services, biomedical instrumentation, measurement systems involving industry, nuclear engineering for scientific research, medicine, and food industry.

The Foundation for Development of Radiocommunications and Multimedia Technologies plays a special role in perpetuating scientific research within our Institute and the whole Faculty. The Foundation subsidizes undergraduate and graduate scholarships. It monitors and awards the progress of young Polish researchers. Its generous support helps us face the socio-economical obstacles, and compete with commercial opportunities awaiting the young people on the open market.

1 .2. Board of Directors

Director of the Institute:

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Deputy Director for Research

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Secretariat:

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Deputy Director for Academic Affairs

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1.3. Organisation of the Institute

The Institute of Radioelectronics consists of the following research and teaching divisions:

- Electroacoustics Division;
- Microwave and Radiolocation Engineering Division;
- Nuclear and Medical Electronics Division;
- Radiocommunications Division;
- Television Division.

The structure of the Institute includes Library, Accounting Department, Supply Section.

1.3.1. Electroacoustics Division

Head of Division

Jan Żera, D.Sc., Professor
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Senior academic staff:

Zbigniew Kulka, Prof. D.Sc., Professor
Wiesław Winiecki, Prof. D.Sc., Professor
Piotr Bilski, D.Sc., Associate Professor (0.75)
Ewa Kotarbińska, Ph.D., Assistant Professor (0.25)
Marcin Lewandowski, Ph.D., Assistant Professor
Robert Łukaszewski, Ph.D., Assistant Professor
Grzegorz Makarewicz, Ph.D., Assistant Professor (0.5 from Nov. 2014)
Krzysztof Mroczek, Ph.D., Assistant Professor
Maria Tajchert, Ph.D., Assistant Professor (0.4)
Piotr Bobiński, Ph.D., Senior Lecturer

Technical staff

Grzegorz Makarewicz, Ph.D., Senior Development Engineer (0.5 from Nov. 2014)
Piotr Nykiel, M.Sc., Senior Development Engineer (till Oct. 2014)

Ph.D. Students

Jakub Pach, M.Sc., from Feb. 2013
Agata Rogowska, M.Sc., from Oct. 2012
Piotr Zawistowski, M.Sc., from Oct. 2010

Retired

Andrzej Leszczyński, Ph.D.

The activities of the Division concern electroacoustics and digital audio techniques, including investigations, measurements and applications. They are focused on:
- foundamentals of acoustics;
- electroacoustics;
- psychoacoustics;
- digital audio;
- design and measurements of electroacoustic transducers;
- investigation and modeling of acoustic field distribution;
- noise control and active noise reduction;
- architectural and industrial acoustics;
- sound studio techniques;
- hearing protection.

Current research topics include:
- digital audio signal processing;
- low-level acoustic signals measurements and analysis;
- objective and subjective methods of sound quality evaluation;
- detection of auditory warning signals in the presence of industrial noise;
- elaboration of computation methods for acoustic field radiated in free space by surface acoustic sources and their implementation on a PC.

The other field of interest concerns fundamental and applied research associated with metrology, instrumentation and measuring systems. It is focused on design of automated computer-based measuring systems. Current research topics include:
- modern information technologies, e.g. LabVIEW, Java, XML, and modern communication technologies, e.g. the Internet, GSM, Bluetooth, ZigBee in distributed control and measuring systems;
- virtual instrumentation, plug-in boards for data acquisition, IEEE-488 equipment;
- artificial intelligence methods in diagnostics of analog systems.

The Division is equipped with an anechoic chamber and sound studio with two control rooms.

1.3.2. Microwave and Radiolocation Engineering Division

Head of Division

Wojciech Gwarek, Prof. D.Sc., Tenured Professor
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e-mail: W.Gwarek@ire.pw.edu.pl

Senior academic staff

Tadeusz Morawski, Prof. D.Sc., Tenured Professor (0.5, till Sept. 2014)
Stanisław Rosłoniec, Prof. D.Sc., Tenured Professor (1 till Jun. 2014, 0.5, from Jul. 2014)
Małgorzata Celuch, Ph.D., Research Assistant Profesor (0.5)
Daniel Gryglewski, Ph.D., Assistant Professor
Paweł Kopyt, Ph.D., Assistant Professor
Przemysław Miazga, Ph.D., Assistant Professor
Dawid Rosołowski, Ph.D., Assistant Professor
Bartłomiej Salski, Ph.D., Assistant Professor
Maciej Sypniewski, Ph.D., Assistant Professor
Wojciech Wojtasiak, Ph.D., Assistant Professor

Research staff of the HEECS, ENIAC Ju Project

Andrzej Więckowski, Ph.D., Senior R&D Eng. (0.5 till Feb. 2014).

Technical staff

Mirosław Lubiejewski, Foreman

Ph.D. students

Michał Gasztold, M.Sc., from Oct. 2012
Marcin Góralczyk, M.Sc., from Oct. 2014
Przemysław Korpas, M.Sc., from Feb. 2010
Mateusz Krysicki, M.Sc., from Oct. 2014
Dawid Kuchta, M.Sc., from Oct. 2014

Retired

Tadeusz Morawski, Prof. D.Sc.

The Microwave and Radiolocation Engineering Division conducts scientific and applied research in the area of electromagnetic field theory, microwave theory and techniques, and measurement techniques for very high frequency ranges. This includes the subjects of computer-aided design, data acquisition and data processing. Specific research topics in 2014 included: design of high-frequency systems for radiocommunication and radar applications (oscillators, synthesizers, modulators, amplifiers, transmitter/receiver modules); methods of synthesis and computer-aided design of passive and active microwave circuits (couplers, power combiners and dividers, switches, transistor circuits); analysis and design of multi-element planar in-phase radar antenna arrays intended to work at high power level; numerical electromagnetic compatibility analysis; methods for measurements of electric and magnetic properties of materials at microwave frequencies; development of numerical methods and implementation of computer programs for full-wave analysis and design of two- and three-dimensional microwave circuits (filters, periodic guiding structures, matching circuits, structures incorporating dispersive and anisotropic media, antennae); methods of coupled electromagnetic-thermodynamic simulations, design of microwave heating applicators for material science applications; methods of coupled electromagnetic-optical modeling; radio-frequency identification and wireless sensing; development of multithread and distributed programming techniques, non-linear programming, and artificial intelligence methods for application in automated design of microwave circuits.

1.3.3. Nuclear and Medical Electronics Division

Head of Division

Krzysztof Zaremba, Prof. D.Sc., Tenured Professor
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e-mail: K.Zaremba@ire.pw.edu.pl

Senior academic staff

Janusz Marzec, D.Sc., Professor
Piotr Bogorodzki, D.Sc., Professor
Waldemar Smolik, D.Sc., Associate Professor
Piotr Brzeski, Ph.D., Assistant Professor
Roman Szabatin, Ph.D., Assistant Professor (0.5)
Grzegorz Domański, Ph.D., Assistant Professor
Michał Dziewiecki, Ph.D., Assistant Professor
Bogumił Konarzewski, Ph.D., Assistant Professor
Robert Kurjata, Ph.D., Assistant Professor
Ewa Piątkowska-Janko, Ph.D., Assistant Professor
Dariusz Radomski, Ph.D., Research Assistant Professor
Tymon Rubel, Ph.D., Assistant Professor (unpaid leave from Oct. 2013 to Sept. 2014)
Błażej Sawionek, Ph.D., Assistant Professor (0.5)
Tomasz Jamrógiewicz, M.Sc., Senior Lecturer
Tomasz Olszewski, M.Sc., Senior Lecturer

Junior academic staff

Jacek Kryszyn, M.Sc., Assistant (0.5)
Jarosław Orzeł, M.Sc., Assistant (0.5)
Wojciech Obrębski, M.Sc., Assistant (0.5 from Nov. 2014)
Marcin Ziembicki, M.Sc., Assistant (0.5 till Jun. 2014, 1 from Jul. 2014)

Technical staff

Błażej Sawionek, Ph.D., Senior R&D Eng. (0.5)
Andrzej Wasilewski, Worker (0.5 from Feb.)
Joanna Witkowska, Specialist

Ph.D. students

Wojciech Gradkowski, M.Sc., from Oct. 2010
Magdalena Jasionowska, M.Sc., from Feb. 2009
Bartosz Kossowski, M.Sc., from Oct. 2013
Jacek Kryszyn, M.Sc., from Oct. 2012
Jarosław Orzeł, M.Sc., from Oct. 2013
Piotr Płoński, M.Sc., from Oct. 2010
Andrzej Rychter, M.Sc., from Oct. 2011
Konrad Werys, M.Sc., from Feb. 2011
Przemysław Wróblewski, M.Sc., from Oct. 2013

Retired:

Zdzisław Pawłowski, Prof. D.Sc.

The research and teaching activities carried out in the Nuclear and Medical Electronics Division are concentrated on two areas: biomedical engineering and nuclear electronics. Research in the interdisciplinary area of biomedical engineering covers a broad range of topics and integrates sophisticated electronics and information technology with elements of medical knowledge. The activity in the area of nuclear engineering is concentrated on the design of electronics systems and data processing software for high energy physics experiments. The

Division's research is focused on the following topics:
- nuclear medicine (emission tomography: SPECT, PET);
- magnetic resonance imaging (MRI), functional MRI, advanced applications of MRI;
- optical tomography;
- quantitative computer-aided tomography;
- tomographic dynamic studies;
- process tomography, impedance tomography;
- analogue and digital radiography;
- medical image processing and recognition;
- methods and instrumentation for electrocardiography;
- medical applications of isotope techniques;
- telemedicine;
- design of apparatus and software for high energy physics experiments;
- data analysis in genetics and proteomics;
- mathematical modeling of physiological and disease processes.

Areas of recent studies include:
- advanced applications of MRI and CT imaging systems, covering: dynamic scanning protocols, a new methodology and instrumentation for functional MRI, fMRI image analysis methods;
- a new contrast media for MRI: functional lung imaging with hyper-polarized He3, Xe129;
- multi-modal imaging of topographic, tomographic and functional studies in medicine;
- electrical instability of heart study research, high resolution ECG systems;
- digital structural radiography, modeling of radiographic imaging systems;
- optical tomography applications in medicine;
- algorithms for image reconstruction for electrical and process tomography;
- construction of capacitance tomographs and sensors for medical and industrial applications;
- study of a bioelectrical activity of a pregnant uterus and using EHG for telemetric monitoring of upcoming labor;
- application of nonlinear predictive algorithms to control of insulin dosing in diabetic patients;
- algorithms for the data analysis in genomics and proteomics;
- development of detectors, front-end electronics, and test devices for high energy physics experiments;
- applications of "soft-computing" methods (neural networks, evolutionary algorithms, etc.) for data processing and analysis in high energy physics experiments.

1.3.4 Radiocommunications Division

Head of Division

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Senior academic staff

Józef Modelski, Prof. D.Sc., Tenured Professor
Jacek Wojciechowski, Prof. D.Sc., Tenured Prof. (0.5)
Kajetana Snopek, D.Sc., Associate Professor
Jacek Cichocki, Ph.D., Reader
Paweł Bajurko, Ph.D., Assistant Professor
Marek Bury, Ph.D., Assistant Professor (0.25)
Krzysztof Derzakowski, Ph.D., Assistant Professor
Wojciech Kazubski, Ph.D., Assistant Professor
Jerzy Kołakowski, Ph.D., Assistant Professor
Tomasz Kosiło, Ph.D., Assistant Professor (0.75 till Sept. 2014, 0.5 from Oct. 2014)
Sebastian Kozłowski, Ph.D., Assistant Professor
Krzysztof Kurek, Ph.D., Assistant Professor
Ryszard Michnowski, Ph.D., Assistant Professor
Mirosław Mikołajewski, Ph.D., Assistant Professor
Juliusz Modzelewski, Ph.D., Assistant Professor
Karol Radecki, Ph.D., Assistant Professor (0.75 till Sept. 2014, 0.5 from Oct. 2014)
Henryk Chaciński, M.Sc., Senior Lecturer (0.7)
Tomasz Keller, Ph.D., Senior Lecturer (0.33)

Junior academic staff

Konrad Godziszewski, M.Sc., Assistant (0.5)

Technical staff

Anna Czarnecka, M.Sc., Senior R&D Engineer
Marek Marcinkowski, Senior Foreman (0.75)
Stanisław Żmudzin, M.Sc., Senior R&D Engineer (0.25)

Ph.D. students

Anna Badawika, M.Sc., from Oct. 2013
Łukasz Błaszczyk, M.Sc., from Oct. 2013
Adrian Bilski, M.Sc., from Feb. 2011
Grzegorz Bogdan, M.Sc., from Oct. 2013
Marcin Darmetko, M.Sc., from Feb. 2012
Konrad Godziszewski, M.Sc., from Feb. 2011
Tomasz Filipek, M.Sc., from Feb. 2012
Anna Łysiuk, M.Sc., from Oct. 2010
Przemysław Piasecki, M.Sc., from Oct. 2013
Wojciech Pieńkowski, M.Sc., from Oct. 2010

Retired

Jan Ebert, Prof. D.Sc.,
Stefan Hahn, Prof. D.Sc.,
Waldemar Kiełek, D.Sc.

The research and teaching activities of the Radiocommunications Division are related to radiocommunication systems and networks, including antennas, signal processing and measurement techniques. The research is focused on analog and digital radio transmission. It includes system design with advanced CAD software, particularly cellular and short range systems, as well as some aspects of electromagnetic compatibility, numerous measurements issues and deep insight into antenna techniques.
The most important research topics include analysis, development and investigation of:
- radiocommunication systems and networks – cellular networks (3G and beyond 3G), short range systems, ad-hoc networks, satellite systems and broadband access networks, MIMO systems, Radio-over-Fiber links, wireless optic systems, energy harvesting devices;
- wireless ultra-wideband systems (UWB) – methods and systems for communication and localization, systems for road safety, microwave imaging systems;
- antennas and propagations – electrodynamics modeling and design of various types of microwave, millimeter, submillimeter and terahertz antennas, including electronically controlled and reconfigurable antennas, photonic antennas, integrated antennas, rectennas, metamaterial based antennas, time-modulated antennas; channel modeling and simulation for MIMO, UWB, and cellular systems;
- measurements – spectrum monitoring methods and systems; channel and antenna including automatic far and near-field measurements of antennas chara-

cteristics in time and frequency domain, antenna and channel pulse response, transfer functions of UWB antennas, transient states in reconfigurable antennas;
- material characterization (including ferroelectric) in range up to 500 GHz;
- RF circuits and microwave devices – high-efficiency resonant power amplifiers (class D, DE, E, F and G), linear wide-band HF amplifiers, high-power amplitude modulators, high-efficiency power supplies, power factor correctors, LNA, microwave filters and phase shifters and their applications in radio transmitters, receivers, and industrial electronics;
- digital radio broadcasting systems – MF and HF DRM transmitters and receivers;
- theory of signals and modulations – multidimensional Hilbert transform and its applications, "time-frequency" transformations for RF signal processing, applications of "time-frequency" techniques in audio watermarking;
- environmental, biological and social problems – the influence of radiocommunication systems on a human health and environment as well as on electronic equipment, protection zones planning, radio systems for aid and support of disabled persons;
- design of large-scale telecommunication networks, designing of the topology of access and aggregation networks, localization of: Content Delivery Network nodes, gateway nodes in sensor networks. Routing in wireless sensor networks;
- fault diagnosis – detection and localization of faults in analog systems of different physical nature, e.g. electronic, mechanical;
- data exploration – large data basis is searched with the aid of graph models. Classification of graphs can be done on the basis of the graph structural patterns, e.g. contrast subgraphs and common subgraphs, Coulomb excitation data analysis – analysis of the data from nuclear physics experiments to approximate the shape of nuclei.

1.3.5. Television Division

Head of Division

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Senior academic staff

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Andrzej Buchowicz, Ph.D., Assistant Professor
Grzegorz Galiński, Ph.D., Assistant Professor
Krystian Ignasiak, Ph.D., Assistant Professor
Andrzej Miękina, Ph.D., Assistant Professor
Jacek Naruniec, Ph.D., Assistant Professor
Grzegorz Pastuszak, Ph.D., Assistant Professor
Andrzej Podgórski, Ph.D., Assistant Professor
Marek Rusin, Ph.D., Assist. Prof. (0,25, till Aug. 2014)
Tomasz Krzymień, M.Sc., Senior Lecturer (0.5)

Ph.D. students

Andrzej Abramowski, M.Sc, from Feb. 2011
Grzegorz Brzuchalski, M.Sc., from Feb. 2011
Błażej Czupryński, M.Sc., from Oct. 2013
Daniel Grzywczak, M.Sc., from Feb. 2013
Grzegorz Gwardys, M.Sc., from Feb. 2013
Marek Kowalski, M.Sc., from Feb. 2014
Paweł Mazurek, M.Sc., from Feb. 2014
Mikołaj Roszkowski, M.Sc., from Oct. 2010
Adam Strupczewski, M.Sc., from Oct. 2013
Maciej Trochimiuk, M.Sc., from Oct. 2012
Jakub Wagner, M.Sc., from Feb. 2014
Michał Wieczorek, M.Sc., from Oct. 2010

Retired

Marek Rusin, Ph.D.

Television Division conducts scientific and applied research in multimedia technologies. The Division is also experienced in multimedia standards and platforms with a special emphasis on tools for collaborative e-learning using media streaming and searching techniques. Recently, important topic of the research is implementation of standard multimedia algorithms in heterogeneous architectures. The Division continues its efforts in the development of MPEG-4 and MPEG 7.
Specific research topics include:
- video and audio compression and watermarking;
- multicamera systems and 3D modeling;
- computer vision;
- image semantic analysis and object recognition;
- human-machine interfaces;
- hardware architectures for multimedia;
- indexing and searching;
- intelligent multimedia systems.

Digital Processing of Measurement Signals Group is active in the field of measurement science and technology. Its research activities are focused on improving the quality of measurements by means of digital signal processing. The current research topics include:
- general-purpose algorithms for reconstruction of measurands and for calibration of measuring channels;
- portable sound-and-vibration analysers for applications in technical diagnostics and in the environmental monitoring;
- radar-based systems for monitoring of disabled and elderly persons;
- ethical aspects of measurement-based empirical research.

1.4. Evening Studies and Continuing Education

1.4.1. Engineer Degree Evening Studies on Radiocommunications and Multimedia Technologies

Organizing coordinator

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1.4.2. Environmental Noise Course

Head

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Secretariat

Joanna Witkowska
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1.5. Other Institute's Units

1.5.1 Library

Curator

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1.5.2 Accounting Department

Head

Janina Nowak
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Staff

Anna Dobrzyńska, (from Dec. 2013 till Jun. 2015)

Edyta Krzyżanowska, M.A. (from Sept. till Nov. 2014)
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Ewa Młynarczyk
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Dorota Podniesińska, M.A. (till Aug. 2014)
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Aleksandra Jefimowicz, M.A.
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(on leave from Dec. 2013)

1.5.3 Supply Section

Staff

Andrzej Laskowski
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e-mail: A.Laskowski@ire.pw.edu.pl

Andrzej Skrzypkowski
room: 419, phone: +48 22 2345018
e-mail: A.Skrzypkowski@ire.pw.edu.pl

1.5.4 Office of the Fundation for the Development of Radiocommunication and Multimedia Technologies

Anna Czarnecka, M.Sc., Senior R&D Engineer
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2. STAFF

2.1. Senior academic staff

Paweł Bajurko
room: 34, phone: +48 22 2347795
e-mail: P.Bajurko@ire.pw.edu.pl
M.Sc. (’04), Ph.D. (’12); antennae and antenna array; **Assistant Professor**, Radiocommunications Division. Recipient of an individual and a team award of the Rector (’14).
[Edu94]; [Pro10], [Pro30], [Pro36], [Pro41]; [BSc73]; [Pub57], [Pub78], [Pub88], [Pub98], [Pub99], [Pub105], [Pub140], [Pub171], [Pub179], [Pub201], [Pub214]; [Pat1].

Piotr Bilski
room: 437, phone: +48 22 2347479
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M.Sc. ('01), Ph.D. ('06), D.Sc. (’14); measurement systems, virtual instrumentation, digital signal processing, diagnostics of analog systems, artificial intelligence; **Associate Professor**, Electroacoustics Division. Bronze Medal for Long-lasting Service at the Warsaw University of Life Sciences (’14).
[Edu1], [Edu68], [Edu69]; [Pro22], [Pro26]; [DSc1]; [MSc16], [MSc49]; [BSc37], [BSc43], [BSc68]; [Pub24], [Pub25], [Pub26], [Pub56], [Pub102], [Pub103], [Pub104], [Pub149].

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[Edu1], [Edu6], [Edu127], [Edu144]; [Pro25], [Pro44]; [MSc43]; [BSc1], [BSc11], [BSc53], [BSc59], [BSc66], [BSc72], [BSc102].

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[Edu84], [Edu85]; [Pro28], [Pro42]; [BSc18], [BSc41]; [Pub1], [Pub27], [Pub29], [Pub38], [Pub147], [Pub184].

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[Edu8], [Edu9], [Edu20], [Edu21], [Edu22], [Edu74]; [Pro28], [Pro43], [Pro46]; [BSc97].

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[Edu59], [Edu70], [Edu121]; [Pro22], [Pro35]; [BSc39], [BSc48], [BSc65]; [Pub60], [Pub181].

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[Edu125]; [MSc60]; [Pat1].

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[Pro2], [Pro27].

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[Edu121]; [Pro32]; [BSc12], [BSc91].

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[Edu12], [Edu44], [Edu48], [Edu104], [Edu107], [Edu119], [Edu120], [Edu124]; [Pro4], [Pro11], [Pro31]; [BSc78].

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[Edu10], [Edu30]; [Pro10], [Pro29], [Pro30]; [Pub171].

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[Edu50], [Edu93]; [Pro7], [Pro8], [Pro28]; [MSc6], [MSc9], [MSc27], [MSc33], [MSc38]; [BSc10], [BSc56], [BSc58]; [Pub62].

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[Edu33], [Edu103]; [Pro6], [Pro7], [Pro8], [Pro28]; [BSc32]; [Pub9], [Pub10], [Pub11], [Pub12], [Pub13], [Pub14], [Pub15], [Pub16], [Pub17], [Pub18], [Pub19], [Pub20], [Pub62].

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[Edu13], [Edu115]; [Pro35]; [MSc17]; [BSc6], [BSc16], [BSc35], [BSc64], [BSc90]; [Pub60], [Pub181].

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[Edu56], [Edu99], [Edu109]; [Pro18], [Pro23], [Pro27]; [MSc13]; [Pub65], [Pub151], [Pub187].

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[Edu20], [Edu21], [Edu22], [Edu28], [Edu67]; [Pro1], [Pro2], [Pro16], [Pro17], [Pro21], [Pro27]; [PhD4]; [MSc12]; [Pub3], [Pub30], [Pub33], [Pub36], [Pub47], [Pub48], [Pub117], [Pub142], [Pub143], [Pub155], [Pub168].

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[Edu10], [Edu25], [Edu42], [Edu144]; [Pro35]; [Pub60], [Pub63], [Pub181], [Pub183].

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[Edu33], [Edu57], [Edu114]; [Pro28]; [MSc11], [MSc37]; [BSc99].

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[Edu4], [Edu128]; [Pro32]; [BSc40], [BSc63], [BSc101].

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[Edu35], [Edu49]; [Pro22], [Pro29]; [MSc4], [MSc7].

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[Edu17], [Edu61], [Edu96]; [Pro4], [Pro11], [Pro31]; [MSc3], [MSc23], [MSc48]; [Pub54], [Pub55], [Pub61], [Pub71], [Pub97], [Pub120], [Pub177], [Pub178], [Pub182], [Pub197].

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[Edu2], [Edu10], [Edu100]; [Pro7], [Pro8], [Pro28]; [MSc51]; [BSc96], [Pub62].

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[Edu76]; [Pro17], [Pro21], [Pro27]; [Pub33], [Pub49], [Pub119], [Pub121], [Pub122], [Pub173]; [Pat2].

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[Edu47], [Edu72], [Edu105], [Edu122], [Edu123], [Edu144]; [Pro23], [Pro32]; [MSc63]; [Pub66], [Pub190].

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[Edu37], [Edu132]; [Pro25]; [BSc42]; [Pub126], [Pub191].

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[Edu88]; [Pro5], [Pro33]; [BSc17]; [Pat1].

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[Edu20], [Edu21], [Edu64], [Edu73], [Edu142], [Edu143]; [Pro25]; [MSc34], [MSc35]; [Pub68], [Pub131].

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[Edu12], [Edu52], [Edu102]; [Pro5], [Pro29]; [MSc46], [MSc57]; [Pub58], [Pub85], [Pub180], [Pub211].

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[Edu7], [Edu57], [Edu95], [Edu98], [Edu111], [Edu118]; [Pro7], [Pro8], [Pro28]; [MSc10], [MSc19], [MSc20], [MSc29]; [BSc30], [BSc69], [BSc100]; [Pub9], [Pub10], [Pub11], [Pub12], [Pub13], [Pub14], [Pub15], [Pub16], [Pub17], [Pub18], [Pub19], [Pub20], [Pub62].

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[Edu58]; [Pro25], [Pro37], [Pro44]; [Pub67], [Pub68], [Pub132], [Pub194], [Pub195].

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[Edu75]; [Pro10], [Pro22], [Pro26]; [MSc2]; [BSc13], [BSc14], [BSc23], [BSc51]; [Pub2], [Pub69], [Pub133].

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[Edu16], [Edu20], [Edu21], [Edu22], [Edu90], [Edu92]; [Pro7], [Pro8], [Pro28]; [BSc26], [BSc57]; [Pub9], [Pub10], [Pub11], [Pub12], [Pub13], [Pub14], [Pub15], [Pub16], [Pub17], [Pub18], [Pub19], [Pub20], [Pub62]; [Pat5].

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[Edu18], [Edu77], [Edu78]; [Pro27]; [Pub137].

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[Pro4], [Pro11], [Pro31]; [Pub71], [Pub197].

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[Edu31], [Edu39], [Edu40], [Edu116]; [Pro10], [Pro34]; [MSc39]; [BSc87]; [Pub51], [Pub140].

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[Edu24]; [Pro32]; [BSc54]; [Pub72], [Pub138].

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[Edu20], [Edu21], [Edu52], [Edu144]; [Pro23], [Pro29]; [PhD2]; [Pub89], [Pub92].

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[Edu4], [Edu128]; [Pro32]; [MSc1], [MSc64]; [BSc2]; [Pub73], [Pub74], [Pub139].

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[Edu26], [Edu31], [Edu39], [Edu40, [Edu87], [Edu145]; [Pro10], [Pro34]; [Pub51], [Pub140], [Pub141].

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[Edu106], [Edu109]; [Pro27]; [Pub3].

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[Edu5], [Edu23]; [Pro26].

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[Edu27], [Edu41], [Edu62], [Edu81]; [Pro35], [Pro38], [Pro45], [Pro47]; [MSc30], [MSc40], [MSc56]; [BSc7], [BSc38]; [Pub37], [Pub75], [Pub76], [Pub126], [Pub198], [Pub199].

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[Edu23]; [Pro15], [Pro28], [Pro43], [Pro46]; [MSc44], [MSc54]; [BSc15]; [Pub35], [Pub128].

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[Pro12], [Pro35]; [BSc3], [BSc28], [BSc70], [BSc85]; [Pub41], [Pub53], [Pub77], [Pub80], [Pub86], [Pub94], [Pub144], [Pub153].

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[Edu33]; [Pro28], [Pro42]; [MSc21], [MSc22], [MSc45], [MSc47]; [BSc71], [BSc98]; [Pub1], [Pub27], [Pub29], [Pub38].

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[Edu11], [Edu31], [Edu39], [Edu40]; [Pro34]; [MSc36].

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[Edu112], [Edu126]; [Pro4], [Pro11], [Pro31]; [BSc75], [Pub66], [Pub190].

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M.Sc. ('03), Ph.D. ('10); medical and nuclear engineering; **Assistant Professor**, Nuclear and Medical Electronics Division.
[Edu83], [Edu113]; [MSc24]; [BSc19], [BSc92]; [Pub5], [Pub23], [Pub39], [Pub90], [Pub91].

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M.Sc. ('66), Ph.D. ('75); radiocommunications, television; **Assistant Professor**, Television Division.
[Edu13], [Edu53], [Edu59].

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M.Sc. ('06), Ph.D. ('10); microwave technique; **Assistant Professor**, Microwave and Radiolocation Engineering Division.
[Edu29], [Edu45], [Edu145]; [Pro3], [Pro13], [Pro17], [Pro27], [Pro39]; [BSc4], [BSc36]; [Pub8], [Pub32], [Pub33], [Pub36], [Pub43], [Pub44], [Pub45], [Pub46], [Pub47], [Pub48], [Pub49], [Pub50], [Pub110], [Pub124], [Pub142], [Pub143], [Pub154], [Pub155], [Pub156].

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M.Sc. (‘91), Ph.D. (’99); medical and nuclear engineering; **Assistant Professor** (0,5), Nuclear and Medical Electronics Division.
[Edu15]; [Pro28]; [BSc5], [BSc22], [BSc55], [BSc86].

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M.Sc. ('72), Ph.D. ('77), D.Sc. ('94); Prof. Title ('03); information technology, image processing, digital media; **Tenured Professor**, Television Division, Head ('00-). Recipient of an individual award of the Rector (’14).
[Edu62], [Edu86], [Edu144]; [Pro35], [Pro45]; [MSc5], [MSc25], [MSc41]; [Pub60], [Pub79], [Pub127], [Pub157], [Pub158], [Pub159], [Pub160], [Pub181], [Pub202].

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M.Sc. ('91), Ph.D. ('97), D.Sc. (’14); biomedical engineering, computer engineering; **Associate Professor**, Nuclear and Medical Electronics Division.
International Board Member of IEEE International Conf. on Imaging Systems and Techniques (’09-).
[Edu46], [Edu65], [Edu82]; [Pro15], [Pro19], [Pro28], [Pro43], [Pro46]; [DSc2]; [MSc50]; [BSc84]; [Pub35], [Pub128], [Pub129], [Pub169], [Pub170].

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M.Sc. ('91), Ph.D. ('02), D.Sc. (’14); signal and system theory and applications; **Associate Professor**, Radiocommunications Division.
Faculty Coordinator of Evening Studies on Radiocommunications ('05-). Recipient of a team award of the Rector (’14).
[Edu54], [Edu55], [Edu126]; [Pro23], [Pro33]; [DSc3]; [BSc94], [BSc95]; [Pub31], [Pub176].

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[Edu27], [Edu43]; [Pro27]; [MSc28]; [BSc89].

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[Edu33], [Edu38], [Edu91]; [Pro15], [Pro28], [Pro43], [Pro46]; [MSc18]; [BSc27], [BSc50]; [Pub35], [Pub128], [Pub129].

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M.Sc. ('69), Ph.D. ('78); electroacoustics, acoustic measurements, architectural acoustics; **Assistant Professor**, Electroacoustics Division.
Member of the Polish Acoustics Society ('70-); Member of the Audio Engineering Society ('91-);
[Edu127], [Edu129], [Edu142], [Edu143]; [Pro25]; [BSc47].

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M.Sc. ('75), Ph.D. ('86), D.Sc. ('03); Prof. Title ('11); measurement and instrumentation; **Professor**, Electroacoustics Division.
Deputy Director for Research of the Institute of Radioelectronics ('08-); Member of the Metrology and Instrumentation Comittee, Polish Academy of Sciences ('07-); Chairman of the Rector Committee on Research and Scientific Instrumentation (’12-); Vice--president of POLSPAR (’11-), Chairman of Measurement Committee of POLSPAR (’11-) Member of the Scientific and Programme Committee of the National Conferences: *Measurement Systems in the Scientific Research and Industry* ('01-), *Metrology Congress* ('06-), *Dynamic Measurements* ('06-), *Computer-Aided Metrology* ('08-), *Fundamental Problems of Metrology* ('09-), *Inter-University Metrologists' Conference* ('12-), and *International Conference IEEE*, *Intelligent Data Acquisition and Advanced Computing Systems IDAACS* ('01-); Member of the *IEEE IDAACS* International Advisory Board ('09-); Reviewer of the *IEEE Transactions on Instrumentation and Measurement* ('03-), *Measurement – Journal of IMEKO* ('08-), *Metrology and Measuring Systems* (07-), *Computer Standards and Interfaces* (11-); Member of the Editorial Board of the *International Journal of Computing* ('06-); Member of Programme Board of the Journal *Pomiary Automatyka Kontrola* ('07-). Recipient of an individual award of the Rector (’14), Medal of National Education Committee (’14).
[Edu1], [Edu32], [Edu75], [Edu101]; [Pro10], [Pro22], [Pro26]; [PhD1]; [MSc31]; [BSc8], [BSc61]; [Pub2], [Pub6], [Pub56], [Pub69], [Pub103], [Pub104], [Pub133], [Pub141], [Pub166].

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M.Sc. (electronics '66), M.Sc. (mathematics '75), Ph.D. ('76), D.Sc. ('89); Prof. Title ('02); telecommunications, teleinformatics, signals and systems, computer aided design, graphs and networks, mathematical methods in engineering; **Tenured Professor**, Radiocommunications Division.
Member of the Circuit Theory and Signal Processing Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('97-); Member of the Scientific Committees of: International Conference on Signals and Electronics Systems ('97-), Conference on Evolutionary Algorithms and Global Optimization ('97-); Coordinator of the cooperation agreement between WUT and University of Waterloo, Canada ('93-); Adviser to *Wydawnictwo Komunikacji i Łączności* – a publishing house in engineering ('97-); Associate Editor of *Journal of the Franklin Institute* ('07-). Recipient of a team award of the Rector (’14).
[Edu19], [Edu22], [Edu79]; [Pro33]; [Pub26], [Pub101].

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M.Sc. ('84), Ph.D. ('98); microwave technique; **Assistant Professor**, Microwave and Radiolocation Engineering Division.
[Edu34], [Edu71]; [Pro18], [Pro20], [Pro23], [Pro27]; [MSc8]; [Pub65], [Pub151], [Pub168], [Pub187].

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e-mail: E.Jaszczyszyn@ire.pw.edu.pl
M.Sc. ('79), Ph.D. ('86), D.Sc. ('06); antennae and antenna array; **Professor**, Radiocommunications Division, Head ('09-).
Member of the Organizing Committee of the International Conference *TCSET- Modern Problems of Radio Engineering, Telecommunications and Computer Science* ('98-); Reviewer of the *IEEE Transactions on Microwave Theory and Techniques* ('04-), *IEEE Transactions on Antennas and Propagation* ('06-) and *IEEE Microwave and Wireless Components Letters* ('04-); Member of Editorial Board of *Izwestiya Wuzow Radioelektronika* ('09-); Member of the Microwave and Radiolocation Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('07-); TPC Member of the MIKON ('09-), TPC Member of the European Wireless Conference EW ('10-), Member of the Programme Committee of the National Conference of Radiocommunications and Broadcasting: KKRRiT ('09-); recipient of a team award of the Rector (’14).
[Edu3], [Edu22], [Edu63], [Edu88]; [Pro10], [Pro30], [Pro41]; [MSc52]; [BSc74], [BSc82], [BSc88]; [Pub7], [Pub64], [Pub70], [Pub78], [Pub83], [Pub84], [Pub87],

[Pub96], [Pub99], [Pub105], [Pub106], [Pub115], [Pub135], [Pub136], [Pub141], [Pub145], [Pub172], [Pub173], [Pub185], [Pub186], [Pub196], [Pub200], [Pub201], [Pub209], [Pub210], [Pub212], [Pub213]; [Pat3], [Pat4].

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M.Sc. ('81), Ph.D. ('90), D.Sc. ('03), Prof. Title (’12), Tenured Prof. (’14); biomedical engineering, nuclear electronics; **Tenured Professor**, Dean of the Faculty (’12-); Nuclear and Medical Electronics Division, Head ('03-).
Member of CERN ('89-); Head of the Warsaw Branch of Polish Society of Medical Physics ('01-‘14); Member (’05-) and Vice-chairman of the University Council Committee on Property and Finances ('12-); Member of the Programme Board of the Institute of Applied Researches, WUT (’14-); Member of the Scientific Board of Inter. Forum on Innovative Technologies for Medicine ITMED (‘07-), Member of the Editorial Advisory Board of the *Polish Journal of Medical Physics and Engineering* (‘07-), Head of the Specialization *Electronics and Information Technology in Medicine* ('06-); Deputy Chairman of the Board of the Center for Imaging and Biomedical Research ('06-); Member of the Board of Polish Eastern Medical Cluster ('08-), Member of the Coordinating Committee (‘10-); Faculty Coordinator of the Field of Studies *Biomedical Engineering* ('08-). Medal of National Education Committee (’14).
[Edu51], [Edu89]; [Pro6], [Pro7], [Pro8], [Pro9], [Pro28]; [BSc34]; [Pub5], [Pub9], [Pub10], [Pub11], [Pub12], [Pub13], [Pub14], [Pub15], [Pub16], [Pub17], [Pub18], [Pub19], [Pub20], [Pub21], [Pub22], [Pub62], [Pub148]; [Pat5].

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Member of Polish Acoustical Society ('78-), European Acoustics Association ('01-), Acoustical Society of America ('90-); Member of the Faculty Board of Department of Sound Enginnering F. Chopin University of Music ('04-); Member of the Technical Committees KT 105 and KT 121 of the Polish Committee for Standardization (’09-).
[Edu36], [Edu80], [Edu144], [Edu145]; [Pro25]; [PhD5]; [MSc26]; [BSc25], [BSc83]; [Pub150], [Pub162], [Pub175], [Pub204], [Pub215].

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2.3. Ph.D. students (the third-level studies)

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Anna Badawika, M.Sc.	*(J. Modelski)*
Adrian Bilski, M.Sc.*	*(J. Wojciechowski)*
Łukasz Błaszczyk, M.Sc.	*(K. Snopek)*
Grzegorz Bogdan, M.Sc.	*(Y. Yashchyshyn)*
Grzegorz Brzuchalski, M.Sc.	*(W. Skarbek)*
Błażej Czupryński, M.Sc.	*(W. Skarbek)*
Tomasz Filipek, M.Sc.	*(J. Modelski)*
Marcin Darmetko, M.Sc.*	*(J. Modelski)*
Michał Gasztold, M.Sc.*	*(S. Rosłoniec)*
Konrad Godziszewski, M.Sc.	*(Y. Yashchyshyn)*
Marcin Góralczyk, M.Sc.	*(W. Gwarek)*
Wojciech Gradkowski, M.Sc.	*(P. Bogorodzki)*
Daniel Grzywczak, M.Sc.	*(W. Skarbek)*
Grzegorz Gwardys, M.Sc.	*(W. Skarbek)*
Magdalena Jasionowska, M.Sc.	*(K. Zaremba)*
Przemysław Korpas, M.Sc.	*(W. Gwarek)*
Bartosz Kossowski, M.Sc.	*(P. Bogorodzki)*
Marek Kowalski, M.Sc.	*(W. Skarbek)*
Mateusz Krysicki, M.Sc.	*(W. Gwarek)*
Jacek Kryszyn, M.Sc.	*(K. Zaremba)*
Dawid Kuchta, M.Sc.	*(W. Gwarek)*
Anna Łysiuk, M.Sc.*	*(Y. Yashchyshyn)*
Paweł Mazurek, M.Sc.	*(R. Z. Morawski)*
Wojciech Obrębski, M.Sc.*	*(K. Zaremba)*
Jarosław Orzeł, M.Sc.	*(P. Bogorodzki)*
Jakub Pach, M.Sc.	*(P. Bilski)*
Przemysław Piasecki, M.Sc.	*(Y. Yashchyshyn)*
Wojciech Pieńkowski, M.Sc.*	*(J. Modelski)*
Piotr Płoński, M.Sc.*	*(K. Zaremba)*
Agata Rogowska, M.Sc.	*(J. Żera)*
Mikołaj Roszkowski, M.Sc.*	*(W. Skarbek)*
Andrzej Rychter, M.Sc.	*(J. Marzec)*
Adam Strupczewski, M.Sc.*	*(W. Skarbek)*
Maciej Trochimiuk, M.Sc.	*(W. Skarbek)*
Jakub Wagner, M.Sc.	*(R. Z. Morawski)*
Konrad Werys, M.Sc.	*(P. Bogorodzki)*
Michał Wieczorek, M.Sc.	*(W. Skarbek)*
Przemysław Wróblewski, M.Sc.	*(K. Zaremba)*
Piotr Zawistowski, M.Sc.	*(W. Winiecki)*

* without scholarship

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Joanna Witkowska, Specialist
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* temporary research staff of the ENIAC JU HEECS project

3. TEACHING ACTIVITIES

(the summer semester of the academic year 2013/2014 and the winter semester of the academic year 2014/2015)

3.1. Regular studies – Main Fields of Study:

1. Telecommunications
Specialization: Radiocommunications and Multimedia Technologies

Head

Jacek Cichocki, Ph.D., Reader
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2. Electronics
Specialization: Electronics and Information Technology in Medicine

Head

Krzysztof Zaremba, Prof. D.Sc., Tenured Professor
room: 72, phone: +48 22 2347955, +48 22 2347497
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3. Biomedical Engineering

Head

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3.1.1. Basic courses

[Edu1] *Acquisition and Data Processing Using LabVIEW* (Akwizycja i przetwarzanie danych z wykorzystaniem LabVIEW – LABV); 30 h/sem.; W. Winiecki, P. Bilski P.Bobiński.

[Edu2] *Analysis of Measurement Data in Medicine* (Analiza danych pomiarowych w medycynie – ADP); 45 h/sem.; B. Konarzewski.

[Edu3] *Antennae and Radiowave Propagation* (Anteny i propagacja fal – AIPF); 45 h/sem.; Y. Yashchyshyn.

[Edu4] *Basic Radio-frequency Circuits* (Podstawowe układy radioelektroniczne – PURAD); 45 h/sem.; J. Modzelewski, W. Kazubski.

[Edu5] *Basics of Digital Technique* (Podstawy techniki cyfrowej – PTCY); 45 h/sem.; K. Mroczek.

[Edu6] *Basics of Sound Techniques* (Podstawy techniki dźwiękowej – PTD); 45 h/sem.; P. Bobiński.

[Edu7] *Basics of Information Techniques* (Podstawy technik Informacyjnych – PTIB); 30 h/sem.; R. Kurjata.

[Edu8] *Basics of Medical Imaging* (Podstawy obrazowania medycznego – POMED); 45 h/sem.; P. Brzeski.

[Edu9] *Basics of Medical Imaging Techniques* (Podstawy technik obrazowania w medycynie – PTOM); 60 h/sem.; P. Brzeski.

[Edu10] *Basics of Microprocessor Technique* (Podstawy techniki mikroprocesorowej – TMIK); 60 h/sem.; K. Derzakowski B. Konarzewski.

[Edu11] *Basics of Programming* (Podstawy programowania – PRM); 60 h/sem.; A. Podgórski.

[Edu12] *Basics of Radiocommunications* (Podstawy radiokomunikacji – PR); 45 h/sem.; J. Cichocki, K. Kurek.

[Edu13] *Basics of Image Techniques* (Podstawy techniki obrazowej – PTO); 45 h/sem.; G. Galiński, M. Rusin.

[Edu14] *Biomedical Accelerators* (Akceleratory biomedyczne – ABM); 30 h/sem.; S. Wronka.

[Edu15] *Computer Graphics* (Grafika komputerowa – GRK); 30 h/sem.; B. Sawionek.

[Edu16] *Detection of Nuclear and Biomedical Signals* (Detekcja sygnałów biomedycznych i jądrowych – DSBJ); 60 h/sem.; J. Marzec.

[Edu17] *Digital Cellular Systems* (Cyfrowe systemy komórkowe – CSK); 45 h/sem.; J. Kołakowski.

[Edu18] *Digital Circuits* – EDC1; 30 h/sem.; P. Miazga (English-medium studies).

[Edu19] *Digital Communications* – EDICO; 60 h/sem.; J. Wojciechowski (English-medium studies).

[Edu20] *Diploma Seminar for Graduate Students 1* (Seminarium dyplomowe magisterskie 1 – SDM1); 30 h/sem.; P. Brzeski, W. Gwarek, Z. Kulka, J. Marzec, J. Modelski.

[Edu21] *Diploma Seminar for Graduate Students 2* (Seminarium dyplomowe magisterskie 2 – SDM2); 30 h/sem.; P. Brzeski, W. Gwarek, Z. Kulka, J. Marzec, J. Modelski.

[Edu22] *Diploma Seminar for Undergraduate Students* (Seminarium dyplomowe inżynierskie – SDI); 30 h/sem.; P. Brzeski, W. Gwarek, J. Marzec, J. Wojciechowski, Y. Yashchyshyn.

[Edu23] *Digital Systems* (Układy cyfrowe – UCYF); 15 h/sem.; K. Mroczek, T. Olszewski.

[Edu24] *Electronic Circuits Supply* (Zasilanie układów elektronicznych - ZUE); 45 h/sem.; M. Mikołajewski.

[Edu25] *Event-Driven Programming* (Programowanie zdarzeniowe – PROZE); 45 h/sem.; K. Ignasiak.

[Edu26] *Ethical Aspects of Research and Engineering* – EEARE; 30 h/sem; R. Z. Morawski (English-medium studies).

[Edu27] *Fast Massively Parallel Computing Methods* (Szybkie masywnie równoległe metody obliczeniowe – SMOR); 60 h/sem.; J. Naruniec, M. Sypniewski.

[Edu28] *Fields and Waves* (Pola i fale – POFA); 45 h/sem.; W. Gwarek.

[Edu29] *Fields, Waves and Antennae* – EFWA; 60 h/sem.; B. Salski (English-medium studies).

[Edu30] *Influence of Electromagnetic Waves on Living Organisms* (Oddziaływanie fal elektromagnetycznych na organizmy żywe – OFE); 30 h/sem.; K. Derzakowski.

[Edu31] *Introduction to Numerical Methods* (Wstęp do metod numerycznych – WNUM); 45 h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski.

[Edu32] *Measurement Systems* (Systemy pomiarowe – SPOM); 30h/sem.; W. Winiecki.

[Edu33] *Medical Electronic Instrumentation* (Elektroniczna aparatura medyczna – EAME); 60 h/sem.; M. Dziewiecki, R. Szabatin, T. Jamrógiewicz, E. Piątkowska-Janko.

[Edu34] *Microwave Technique (*Technika mikrofalowa – TMO); 60 h/sem.; W. Wojtasiak.

[Edu35] *Multi-service and Multimedia Networks* – EMSMN; 60 h/sem.; T. Keller (English-medium studies).

[Edu36] *Musical Acoustics* (Akustyka muzyczna – AM); 30 h/sem.; J. Żera.

[Edu37] *Noise Control* (Ochrona przed hałasem – OPH); 30 h/sem.; E. Kotarbińska (for Faculty of Environmental Engineering).

[Edu38] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej – TMENU); 30 h/ sem.; R. Szabatin.

[Edu39] *Numerical Methods* (Metody numeryczne – MNUB); 45 h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski.

[Edu40] *Numerical Methods* – ENUME; 60 h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski (English-medium studies).

[Edu41] *Object-oriented Programming M* (Programowanie obiektowe M – PROE); 60 h/sem.; J.Naruniec.

[Edu42] *Object-oriented Programming of Multimedia Applications in Java (*Java – obiektowe programowanie aplikacji multimedialnych – OPA); 45 h/sem.; K. Ignasiak.

[Edu43] *Operating Systems* (Systemy operacyjne – SOE); 15h/sem.; M. Sypniewski.

[Edu44] *Orientation* (Orientacja – ORM); 15 h/sem.; J. Cichocki.

[Edu45] *Physics 2* – EPHY2; 60 h/sem.; B. Salski (English-medium studies).

[Edu46] *Programming Languages* (Języki programowania - JP); 75 h/sem.; W. Smolik.

[Edu47] *Radiocommunication Systems* (Systemy radiokomunikacyjne – SRKO); 45 h/sem.; T. Kosiło, K. Godziszewski.

[Edu48] *Radioelectronics Measurements (*Miernictwo radioelektroniczne – MR); 45 h/sem.; J. Cichocki.

[Edu49] *Radio Networks and Systems* (Systemy i sieci radiowe – SISR); 45 h/sem.; T. Keller, K. Godziszewski.

[Edu50] *Radiological Apparatus in Medical Diagnostics* (Aparatura radiologiczna w diagnostyce medycznej – ARDM); 30 h/sem.; G. Domański.

[Edu51] *Radiology and Nucleonics* (Radiologia z nukleoniką – RN); 45 h/sem.; K. Zaremba.

[Edu52] *Satellite Communications* (Łączność satelitarna – LS); 45 h/sem.; K. Kurek, J. Modelski.

[Edu53] *Selected Problems of Modern Television* (Wybrane zagadnienia współczesnej telewizji – WZWT); 30 h/sem.; M. Rusin.

[Edu54] *Signals and Systems* (Sygnały i systemy – SYGSY); 60 h/sem.; K. Snopek.

[Edu55] *Signals, Modulations and Systems (*Sygnały, modulacje i systemy – SYMSE); 60 h/sem.; K. Snopek.

[Edu56] *Simulations of Radioelectronics Circuits* (Symulacja układów radioelektronicznych – SUREL); 45 h/sem.; D. Gryglewski.

[Edu57] *Software for Medical Systems (*Oprogramowanie systemów medycznych – OSM); 45 h/sem.; R. Kurjata, T. Jamrógiewicz.

[Edu58] *Sound Recording Technique* (Dźwiękowa technika studyjna – DTS); 45 h/sem.; M. Lewandowski.

[Edu59] *Television Systems* (Systemy telewizyjne – SYTE); 45 h/sem.; A. Buchowicz, M. Rusin.

[Edu60] *Ultrasonography Instrumentation* (Aparatura ultrasonograficzna – AUS); 45 h/sem.; R. Jóźwiak.

[Edu61] *UMTS System (System UMTS – UMTS);* 45 h/sem.; J. Kołakowski.

3.1.2 Advanced courses

[Edu62] *Analysis and Multimedia Indexing* (Analiza i indeksowanie multimediów – AIM); 60 h/sem.; W. Skarbek, J.Naruniec

[Edu63] *Antennae Theory and Design* (Teoria i projektowanie anten – TPA); 60 h/sem.; Y. Yashchyshyn.

[Edu64] *Audio Equipment Investigation* (Badania urządzeń audio – BUA); 45 h/sem.; Z. Kulka.

[Edu65] *Computed Tomography* (Tomografia komputerowa – TOM); 60 h/sem.; W. Smolik.

[Edu66] *Computer - Aided Medical Image Diagnostics* (Komputerowe wspomaganie obrazowej diagnostyki medycznej – KWOD); 45 h/sem.; A. Przelaskowski.

[Edu67] *Computional Electromagnetics for Telecommunications* – ECOET); 60 h/sem.;

W. Gwarek, A. Więckowski (English-medium studies).

[Edu68] *Contemporary Heuristic Techniques* – ECOHT; 60 h/sem.; P. Bilski (English-medium studies).

[Edu69] *Contemporary Heuristic Techniques* (Współczesne techniki heurystyczne – WMH); 60 h/sem.; P. Bilski.

[Edu70] *Data Compression* (Kompresja danych – KODA); 45 h/sem.; A. Buchowicz.

[Edu71] *Design of Microwave Circuits* (Projektowanie układów mikrofalowych – PUM); 60 h/sem.; W. Wojtasiak, S. Rosłoniec.

[Edu72] *Design of Radiocommunication Systems* (Projektowanie układów radiokomunikacyjnych – PSRD); 60 h/sem.; T. Kosiło.

[Edu73] *Digital Audio Signal Processing* (Cyfrowe przetwarzanie sygnałów fonicznych – CPSF); 45 h/sem.; Z. Kulka.

[Edu74] *Digital Image Processing* (Cyfrowe przetwarzanie obrazów – CPOO); 30 h/sem.; P. Brzeski.

[Edu75] *Distributed Measurement and Control Systems* (Rozproszone systemy pomiarowo-kontrolne – RSPK); 45 h/sem.; W. Winiecki, R. Łukaszewski.

[Edu76] *Electromagnetic Compatibility* (Kompatybilność elektromagnetyczna – KE); 30 h/sem.; P. Kopyt.

[Edu77] *Evolutionary Algorithms* – EEVAL; 60 h/sem.; P. Miazga (English-medium studies).

[Edu78] *Evolutionary Algorithms (*Algorytmy ewolucyjne – AE); 45 h/sem.; P. Miazga.

[Edu79] *Graphs and Networks* (Grafy i sieci – GIS); 60 h/sem.; J. Wojciechowski.

[Edu80] *Hearing and Sound Perception* (Słyszenie i percepcja dźwięku – SPD); 30 h/sem.; J. Żera.

[Edu81] *Image and Audio Semantic Analysis* (Analiza semantyczna dźwięku i obrazu – ASOD); 45 h/sem.; J. Naruniec.

[Edu82] *Informatics Systems in Medicine* (Systemy informatyczne w medycynie – SIM); 45 h/sem.; W. Smolik.

[Edu83] *Large-scale Measurement Methods in Molecular Biology* (Wielkoskalowe metody pomiarowe w biologii molekularnej – MPB); 45 h/sem; T. Rubel.

[Edu84] *Magnetic Resonance Imaging* (Tomografia rezonansu magnetycznego – TRM); 45 h/sem.; P. Bogorodzki.

[Edu85] *Magnetic Resonance in Biomedical Applications* (Rezonans magnetyczny w zasosowaniach biomedycznych – PWS16); 30 h/sem.; P. Bogorodzki.

[Edu86] *Mathematics in Multimedia* (Matematyka w multimediach – MATMU); 60 h/sem.; W. Skarbek.

[Edu87] *Methodological and Ethical Aspects of Research* – EMAR); 45 h/sem.; R. Z. Morawski.

[Edu88] *Modern Radio Transmission Techniques* (Nowe techniki transmisji radiowej – NTTR); 45 h/sem.; Y. Yashchyshyn, S. Kozłowski.

[Edu89] *Neural Networks in Biomedical Applications* (Sieci neuronowe w zastosowaniach biomedycznych – SNB); 45 h/sem., K. Zaremba.

[Edu90] *Noise and Electromagnetic Interference in Electronic Devices* (Szumy i zakłócenia w aparaturze elektronicznej – SZAE); 45 h/sem., J. Marzec.

[Edu91] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej – TMN); 60 h/sem.; R. Szabatin.

[Edu92] *Radiation Detection* (Detekcja promieniowania jonizującego – DEPJO); 30 h/sem.; J. Marzec.

[Edu93] *Radiological Equipment in Medical Diagnostics* (Aparatura radiologiczna w diagnostyce medycznej – ARDM); 30 h/sem.; G. Domański.

[Edu94] *Radio Navigation and Identification Systems* (Radiowe systemy lokalizacji i identyfikacji – RADS); 45 h/sem.; P. Bajurko.

[Edu95] *Telemedical Systems* (Systemy telemedyczne - TELM); 45 h/sem., R. Kurjata.

[Edu96] *Ultrawideband Technologies* (Techniki ultraszerokopasmowe - TUSP); 45 h/sem., J. Kołakowski.

3.2. Special courses

3.2.1 Engineer Degree Evening Studies on Radiocommunications and Multimedia Technologies

[Edu97] *Antennae* (Anteny – ANM); 30 h/sem.; semester 4; S. Rosłoniec.

[Edu98] *Basics of Computer Techniques* (Podstawy techniki komputerowej – PKOM); 45 h/sem.; semester 1; R. Kurjata.

[Edu99] *Basics of High-Frequency Techniques* (Podstawy techniki w.cz. – PTWM); 60 h/sem.; semester 3; D. Gryglewski.

[Edu100] *Basics of Logical Circuits and Microprocessor Technique* (Układy logiczne i podstawy techniki mikroprocesorowej – PULM); 60 h/sem.; semester 4; B. Konarzewski.

[Edu101] *Basics of Metrology* (Podstawy metrologii – PMEM); 45 h/sem.; semester 1; W. Winiecki.

[Edu102] *Basics of Satellite Communications* (Podstawy łączności satelitarnej – SATM); 15 h/sem.; semester 4; K. Kurek.

[Edu103] *Circuits and Signals* (Obwody i sygnały – OSRM); 45 h/sem.; semester 2; M. Dziewiecki.

[Edu104] *Digital Cellular Systems* (Cyfrowe systemy komórkowe – CSKM); 36 h/sem.; semester 7; J. Cichocki.

[Edu105] *Digital Signals Transmission* (Cyfrowa transmisja sygnałów – CTSM); 45 h/sem.; semester 5; T. Kosiło.

[Edu106] *Diploma Seminar for Undergraduate Students* (Seminarium dyplomowe – SDM); 15 h/sem.; T. Morawski.

[Edu107] *Diploma Seminar for Undergraduate Students 2* (Seminarium dyplomowe 2 – SD2M); 30 h/sem.; J. Cichocki.

[Edu108] *Electronic Circuits* (Układy elektroniczne – UEM); 45 h/sem.; semester 3; D. Gryglewski.

[Edu109] *Fields and Waves* (Pola i fale – PFM); 60 h/sem.; semester 2; T. Morawski, D. Rosołowski.

[Edu110] *Internet Techniques* (Techniki Internetowe – TINM), 30 h/sem.; semester 7; K. Ignasiak.

[Edu111] *Introduction to Programming* (Wstęp do programowania – WPRM); 15h/sem.; semester 2; R. Kurjata.

[Edu112] *Materials and Elements* (Materiały i elementy – MEM); 15 h/sem.; semester 3; K. Radecki.

[Edu113] *Multimedia Applications* (Aplikacje multimedialne – AMRM); 30 h/sem.; semester 5; T. Rubel.

[Edu114] *Multimedia Computer Systems* (Multimedialne systemy komputerowe – MSKM); 30 h/sem.; semester 4; T. Jamrógiewicz.

[Edu115] *Multimedia Techniques* (Techniki Multimedialne – TMM); 30 h/sem.; semester 6; G. Galiński.

[Edu116] *Numerical and Statistical Techniques* (Techniki obliczeniowe i symulacyjne – TOSM); 30 h/sem.; semester 4; A. Miękina.

[Edu117] *Programmable Digital Devices* (Programowalne układy cyfrowe – PUCM); 30 h/sem.; semester 5; M. Ziembicki.

[Edu118] *Programming* (Programowanie – PMRM); 30 h/sem.; semester 3; R. Kurjata.

[Edu119] *Project 1* (Projekt 1 – PJUM); 30 h/sem.; semester 5; J. Cichocki.

[Edu120] *Project 2* (Projekt 2 – PSRM); 60 h/sem.; semester 6; J. Cichocki.

[Edu121] *Radiodiffusion Systems* (Systemy radiodyfuzyjne – SRDM); 60 h/sem.; semester 6; A. Buchowicz, H. Chaciński.

[Edu122] *Radiocommunication Systems 1* (Systemy radiokomunikacyjne 1 – SRKM); 60 h/sem.; semester 6; T. Kosiło.

[Edu123] *Radiocommunication Systems 2* (Systemy radiokomunikacyjne 2 – SRK2M); 60 h/sem.; semester 7; T. Kosiło.

[Edu124] *Radioelectronics Measurements* (Miernictwo radioelektroniczne – MRM); 45 h/sem.; semester 5; J. Cichocki.

[Edu125] *Rules of Industrial Property* (Prawa własności przemysłowej – PWPR); 15 h/sem.; semester 7; M. Bury.

[Edu126] *Signals and Modulations* (Sygnały i modulacje – SMRM); 60 h/sem.; semester 3; K. Snopek, K. Radecki.

[Edu127] *Sound Techniques* (Techniki dźwiękowe – TDRM); 30 h/sem.; semester 7; M. Tajchert, P. Bobiński.

[Edu128] *Technique of Emission and Receiving* (Technika emisji i odbioru – TEM); 45 h/sem.; semester 5; J. Modzelewski, W. Kazubski.

3.2.2. Environmental Noise Course

The Environmental Noise Course represents a series of courses; 135h.

[Edu129] *Basics of Acoustics* (Podstawy akustyki); 25h; M. Tajchert, A. Leszczyński.

[Edu130] *Basics of Statistics* (Podstawy statystyki); 10h; M. Kirpluk.

[Edu131] *Environment Noise Prediction* (Prognozowanie emisji hałasu w środowisku); 10h; M. Kirpluk.

[Edu132] *Noise in the Workplace* (Hałas w środowisku pracy); 6h; E. Kotarbińska.

[Edu133] *Legal Environment Noise Regulations* (Regulacje prawne w zakresie ochrony środowiska przed hałasem); 4h; M. Wojciechowska.

[Edu134] *Noise Measuring and Monitoring Methods* (Metody pomiaru i monitorowania hałasu); 16h; M. Kirpluk, J. Maciejczyk, P. Tomczyk.

[Edu135] *Noise Control* (Zabezpieczenia akustyczne); 10h; J. Sikora, G. Makarewicz.

[Edu136] *Human Health Effects of Noise* (Wpływ hałasu na organizm ludzki); 4h; Z. Koszarny.

[Edu137] *Noise Mapping* (Mapy akustyczne); 6h; J. Grabowski.

[Edu138] *Research Laboratories Accreditation* (Akredytacja laboratoriów badawczych); 6h; M. Szeląg.

[Edu139] *Selected Problems in Building Acoustics* (Wybrane zagadnienia z akustyki budowlanej); 16h; M. Niemas.

[Edu140] *Uncertainty of Noise Measurements* (Niepewność pomiarów); 8h; M. Kirpluk.

[Edu141] *Workshop - Noise Measurements* (Warsztaty - pomiary hałasu); 10h; M. Kirpluk, J. Maciejczyk, P. Tomczyk.

3.2.3. B.Sc. Level e-learning Special Courses

Warsaw University of Technology Distant Learning Center – OKNO (Ośrodek Kształcenia na Odległość Politechniki Warszawskiej – OKNO)

[Edu142] *Basics of Sound Technique* (Podstawy techniki dźwiękowej); 30 h/sem.; Z. Kulka, A. Leszczyński ,M. Tajchert.

[Edu143] *Systems and Devices of Sound Technique* (Urządzenia i systemy techniki dźwiękowej); 30 h/sem.; Z. Kulka, A. Leszczyński, M. Tajchert.

3.3. Educational projects

[Edu144] **International Master's Degree in multiMEDIA – Technology, Design, Management** (Studia II stopnia w języku angielskim: multimedia – technologie, projektowanie, zarządzanie)
Józef Modelski, W. Skarbek, J. Żera, P. Bobiński, K. Ignasiak, T. Kosiło;
Apr. 11, 2014 – Dec. 31, 2016
Foundation for the Development of the Education System, Norway Grants

The main objective of the project is to improve the quality of education and tailoring the teaching offer of the Warsaw University of Technology to the needs of labour market. The project is divided into 56 tasks and supports more than 21,000 people. Most of the action is addressed to students and PhD students, while a small part supports academic staff and people outside the academic staff.

3.4. International co-operation

[Edu145] **Advanced Technology Higher Education Network / Socrates** (**ATHENS**)

Within the Advanced Technology Higher Education Network / Socrates (ATHENS), the following courses were offered from:

"Ethical Aspects of Research and Engineering" was given by **Roman Z. Morawski** from March 17 to March 21, 2014;

"Sound: Hearing and Acoustical Measurements" was given by **Jan Żera** from November 17 to November 21, 2014 to a group of 29 students.
The students who attended this course were from the following EU institutions of higher education:

- Aristotle University of Thessaloniki, Greece (1 person);
- École Nationale Supérieure des Arts et Métiers, Paris, France (1 person);
- École Supérieure de Physique et de Chimie Industrielle, Paris, France (3 persons);
- Instituto Superior Tecnica, Lisboa, Portugal (3 persons);
- Katholieke Universiteit Leuven, Leuven, Belgium (8 persons);
- Politecnico di Milano, Milano, Italy (3 persons);
- Technische Universiteit Delft, The Netherlands (3 persons);
- Technische Universität München, München, Germany (1 person)
- Technische Universität Wien, Wien, Austria (1 person)
- Universidad Politécnica de Madrid, Madrid, Spain (5 persons).

The courses included 20 hours of lectures and 10 hours of class tutorials.

"Computer Modelling for Electromagnetics: Visibility of the Invisible" was given by **Bartłomiej Salski**.
The courses included 20 hours of lectures and 10 hours of class tutorials.
Universidad Politecnica de Madrid (7 persons);

- Politecnico di Milano (3 persons);
- Delf University of Technology (3 persons);
- Institutio Superior Tecnico Lisboa (4 persons);
- BME (4 persons);
- Technische Universität München (2 persons);
- Technische Universität Wien (1 person);
- CVUT (2 persons);
- Institut d'Optique Graduate School (1 person).

The courses included 18 hours of lectures and 9 hours of class tutorials.

4. RESEARCH ACTIVITIES

4.1. International projects

4.1.1. European grants

[Pro1] **Innovative Technologies of Multifunctional Materials and Structures for Nanoelectronics, Photonics, Spinotronics and Sensors** (Innowacyjne technologie wielofunkcyjnych materiałów i struktur dla nanotechniki, fotoniki, spinotroniki i technik sensorowych).
Wojciech Gwarek;
Feb. 26, 2009 – Jun. 30, 2014
INTechFun, EU Integrated Project

This project was carried out at Institute of Radioelectronics, WUT, Institute of Electron Technology, Institute of Physics - Polish Academy of Sciences, Silesian University of Technology, Technical University of Lodz, Military University of Technology. The main aim of this project was to integrate different semiconductors and technologies and develop new semiconductor devices based on creative and innovative technological solutions and designs. The project was focused on wide bandgap materials like zinc oxide and related film, gallium nitride and related epitaxial layers, silicon carbide. The functional thin layers for ohmic and rectifying contacts, interconnections, gate dielectrics have been developing based on four material groups: stable thermal oxides, nitrides, carbides and borides.

[Pro2] **High Efficiency Electronics Cooking Systems**
Małgorzata Celuch, A. Więckowski, W. Gwarek, P. Korpas;
Mar. 1, 2011 – Feb. 28, 2014
HEECS, ENIAC JU Project

The HEECS project answers the need to increase energy efficiency, developing a smart, controlled and highly efficient solid state cooking device and give significant contributions to standards. This cooking appliance represents a breakthrough innovation which currently does not exist on the market. HEECS would deliver a new concept Microwave Oven. The main project scope was to enhance energy efficiency by more than 25% in microwave ovens (MWOs) across any range of food to be heated or cooked at home. According to this scope, breakthrough technologies is researched and developed according to 4 HEECS main project objectives: 1) New and improved semiconductor technologies mainly focused on innovative high frequency power solid state devices. 2) Improved thermal management systems to efficiently cool the high frequency power transistor package, and make use of the dissipated heat energy in an efficient way. 3) Intelligent electromagnetic (EM) field adjustment and high frequency controls, in order to better distribute the field intensity within differing food types, there by heating the food appropriately and decreasing losses. 4) Optimized MWO technology configuration and system architecture delivering optimum feeding and efficiency of the MWO through enhanced signal conditioning. Matching the overall ENIAC objectives, all the electronic parts of the solid state cooking device, including small signal board (frequency synthesizer, high speed RF switching, micro controller), Switched mode power supply unit, high frequency power amplification stages, RF sensing and coupling, is built with miniaturised circuits. The thermal management of the RF power devices also incorporate thermal / material aspects relevant to ensure reliability and miniaturisation within the hybrid transistor package. The project also delivers TCAD, and multi-physics tools enabling design of new technologies related to RF Hybrid circuit integration, phased array controls, and thermal design of High Frequency power transistor packages.

[Pro3] **Radio Frequency Sensing for Non-Destructive Testing of Carbon Fibre Reinforced Composite Materials for Structural Health Monitoring** (Czujniki radiowe do badania nieniszczącego materiałów kompozytowych wzmacnianych włóknami węglowymi do celów monitorowania stanu strukturalnego).
Bartłomiej Salski;
Dec. 01, 2012 – Nov. 30, 2014
CompHealth, FP 7, EU Integrated Project

This project was carried out at Institute of Radioelectronics and Institute of Control and Industrial Electronics, Faculty of Electrical Engineering, WUT. The main aim of this project was to develop a mobile scanner which can be used to detect defects in composite materials and components, at both the point of manufacture and in-service/in-situ, with a reliability of >99%. The elaborated technique uses a novel rafio frequency (RF) with remote sensing and improved scanning speed to detect defects in a range of fibre reinforced composite materials.

[Pro4] **Design of Enhanced Reliable GNSS/ UWB Personal Navigation Devices**
Jerzy Kołakowski, R. Michnowski, A. Badawika, J. Cichocki, K. Radecki;
Nov. 01, 2013 – Oct. 31, 2015
EIGER FP 7, EU Integrated Project

The project focuses on the design of a propagation environment-independent hybrid GNSS/UWB-based standalone Personal Navigation Device (PND) that is able to meet the today's most stringent Location Based Services (LBS) requirements in both outdoor and indoor situations. The envisaged PND exploits tightly coupled GNSS and UWB positioning techniques to efficiently act in both outdoor and indoor situations through its intrinsic capability to compute its position using almost indistinctly range/pseudorange measurements based on the received GNSS and UWB signals. The main application of this device is dedicated, but not limited, to situations where transitioning from indoor to outdoor, are frequent and unavoidable such as: shopping malls, warehouses, large scale metropolitan events, ports and airports.

[Pro5] **Satellite Adaptive Communication Channel** (Projekt SACC – satelitarny adaptacyjny system łączności).
Krzysztof Kurek, S. Kozłowski, M. Darmetko;
Mar. 01, 2013 – Feb. 28, 2015
Funded by the European Space Agency (Europejska Agencja Kosmiczna)

The aim of the project is realization of a model of adaptive communication system for small satellite in low Earth orbit (LEO). Depending on a distance between the satellite and the ground station during the satellite passage, the system will adaptively

change parameters of the transmitted signal (modulation, channel code, bit rate) in order to maximize total amount of the data transmitted from satellite. The project is realized in cooperation with Space Research Centre PAS, Nicolaus Copernicus Astronomical Centre PAS and Astri Polska.

[Pro6] **Super-Kamiokande Plus**
Krzysztof Zaremba, M. Dziewiecki, M. Ziembicki, A. Rychter
Nov. 11, 2014 – Nov. 11, 2018
Horizon 2020, EU Framework Programme for Research and Innovation

The project is realized in the frame of MSCA-RISE-2014: Marie Skłodowska-Curie Research and Innovation Staff Exchange, as a part of collaboration between the Warsaw University of Technology, Institute of Radioelectronics, the A. Soltan Institute of Nuclear Studies and Universidad Autonoma de Madrid. This project is a part of ongoing global efforts to understand the most fundamental elements of matter and their interactions. We aim to investigate neutrino interactions using the existing experimental facility in Japan, the Super-Kamiokande (SK) detector located in the Kamioka Observatory (Gifu Prefecture) and owned by the Partner of this project: the Institute for Cosmic Ray Research of the University of Tokyo. The collaborative work with the leaders of the field, the Japanese Groups and Research Facilities, should assure the researches the gain of an invaluable experience from these studies, covering neutrino physics, cosmology, astrophysics, technical design, construction and operation of water Cherenkov detectors, data analysis techniques, hardware and software development for the new generation detectors.

4.2 Projects granted by the Ministry of Science and Higher Education (National Centre for Research and Development, and National Science Center)

4.2.1. International grants

[Pro7] **The COMPASS Experiment – the Research on the Spin Structure of Nucleon** (Eksperyment COMPASS – badanie spinowej struktury nukleonu).
Krzysztof Zaremba, J. Marzec, M. Dziewiecki, G. Domański, B. Konarzewski, R. Kurjata, M. Ziembicki, A. Rychter;
COMPASS, International project realized in collaboration with the Andrzej Soltan Institute for Nuclear Studies and Faculty of Physics, Warsaw University;
Dec. 12, 2011 – Apr. 15, 2015
Funded by the National Science Center

The project is a part of the long-term collaboration between the Institute of Radioelectronics and the international high-energy physics experiment COMPASS (Na58) at CERN (Geneva). Within the framework of a new program the team from the Institute of Radioelectronics is responsible (together with the teams from the A. Soltan Institute of Nuclear Studies, and Warsaw University) for the design of new methods of the experimental data analysis, including applications of the "soft computing" methods (neural networks, genetic algorithms etc.). The Institute is also involved in preparations of the hardware upgrade of the COMPASS experiment for the new physical program.

[Pro8] **The T2K Neutrino Second Generation Experiment** (T2K – eksperyment neutrinowy drugiej generacji).
Krzysztof Zaremba, J. Marzec, M. Dziewiecki, G. Domański, B. Konarzewski, R. Kurjata, M. Ziembicki, P. Płoński;
HARMONIA, International project realized in collaboration with the Faculty of Physics, Warsaw University, the Andrzej Soltan Institute for Nuclear Studies, the Henryk Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences, Faculty of Physics and Astronomy, Wroclaw University, Silesian University;
Oct. 10, 2012 – Apr. 15, 2015
Funded by the National Science Center

The main aim of this project is the software development and responsibility for modules associated with SMRD, NuWro software for the simulation of neutrino interactions, quality control and data analysis tools, dedicated software, investigations of ND 280 detector.

[Pro9] **Properties of Neutrinos and Decay of Protons in Large Liquid Argon T600 Detector for ICARUS Experiment** (Własności neutrin i rozpady protonu – badania przy użyciu wielkiego ciekło-argonowego detektora T600 eksperymentu ICARUS).
Krzysztof Zaremba, P. Płoński;
HARMONIA, International project realized in collaboration with the Andrzej Soltan Institute for Nuclear Studies, the Henryk Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences, Silesian University;
Dec. 21, 2012 – Dec. 20, 2015
Funded by the National Science Center

The aim of project is analyzing properties of neutrinos and decay of protons in large liquid argon detector. The Nuclear and Medical Electronics Division group contributes in the project. The main area of work is concentrated in developing automatic system for events recognition. The group proposed an algorithm for designating the number, direction and particle's type of tracks which start from initial vertex.

[Pro10] **Care Support for Elderly and Disabled People by Radar Sensor Technology** (Wsparcie dla osób starszych i niepełnosprawnych poprzez technologię czujnika radarowego).
Wiesław Winiecki, R. Z. Morawski, Y. Yashchyshyn, K. Derzakowski, R. Łukaszewski, A. Miękina, P. Bajurko, K. Godziszewski;
RADCARE, Polish-Norwegian international project realized in collaboration with Bergen University College, Norway
May 1, 2013 – Apr. 30, 2016
Funded by the National Centre for Research and Development

The primary objective of this project is to examine new applications of impulse radar technology in preventive care and diagnostics of various health conditions. The investigated technique for supervision of human beings is an alternative to the techniques based on visual cameras and wearable devices. It enables non-invasive measurements of both human

body movements and selected bodily functions. Its applicability and usefulness in the nursing homes will be examined, and corresponding prototype solutions will be developed.

[Pro11] **Networked Infrastructure for Innovative Home Care Solutions** (Infrastruktura sieciowa dla innowacyjnych rozwiązań w obszarze opieki domowej).
Jerzy Kołakowski, R. Michnowski, K. Radecki, J. Cichocki, A. Badawika;
May 25, 2013 – Jul. 31, 2015
NITICS, AAL Joint Programme
Funded by the National Centre for Research and Development

The aim of the NITICS project is to develop an integrated platform that enables the implementation and deployment of mobility services for disabled people more quickly and more cost effectively, including many services that can keep their cognitive capability (at both physical capabilities affected by cognitive impairments and mental level) intact.

4.2.2. Grants for Young Researchers

[Pro12] **Hardware Architectures for Real-Time Multi-Source Audiovisual Coding** (Architektury sprzętowe dla wielośródłowego audiowizualnego kodowania czasu rzeczywistego).
Grzegorz Pastuszak;
Aug. 1, 2011 – Jul. 31, 2014
LIDER Programme

The goal of the project is the design and prototype implementation of real-time audiovisual compression with the support for the multi-view disparity map. The practical effect of the project will be the reference hardware application of the real-time FPGA-based system including multi-channel audio compression, multi-view video compression, and disparity estimation. The digital part of the system will be integrated in one FPGA device. The hardware acceleration and new encoder architectures will allow higher audiovisual compression efficiencies compared to existing solutions. The accurate multi-view disparity estimation will support the video compression and allow the depth maps needed in the 3D reconstruction. Additionally, the multi-channel audio will provide information to identify the localization of objects. Therefore, the implementation of the system will provide tools to build a free-view-point system in the future.

[Pro13] **Hybrid Modeling of a Laser Action with the Finite Difference Time Domain Method** (Modelowanie hybrydowe zjawiska akcji laserowej w oparciu o metodę różnic skończonych w dziedzinie czasu).
Bartłomiej Salski;
Jun. 19, 2013 – Jun. 18, 2015
Iuventus Plus Programme

The aim of the project is to develop a hybrid FDTD algorithm, based on semi-classical approach, describing the two- and four-level atomic systems, which can represent absorption and gain processes, respectively. The approach investigated in this project is entirely novel, where full-wave FDTD method for solving Maxwell curl equations for arbitrary geometry are applied without a dramatic increase of computational effort imposed by long relaxation times. This work contributes to greater dissemination of the FDTD method in the design process of integrated laser structures, which has been dominated by approximate methods and will fill the niche market of design tools for non-linear elements of photonic integrated circuits.

[Pro14] **Linearization Methods of Microwave Pulse Power Amplifiers** (Opracowanie metod linearyzacji mikrofalowych impulsowych wzmacniaczy mocy).
Tomasz Filipek;
May 01, 2013 – Jan. 31, 2015
Ventures Programme
Funded by the Foundation for Polish Science, cofinanced from EU, Regional Development Fund.

The aim of the project is to develop linearization methods for microwave power amplifiers, for distortion minimization in transmit/receive modules.

4.2.3. Research grants

[Pro15] **ET(V4) Electrical Capacitance Tomograph for 3D Imaging of Dynamic Progresses** (Elektryczny tomograf pojemnościowy ET(V4) do trójwymiarowego obrazowania procesów dynamicznych).
Roman Szabatin, W. Smolik, P. Czarnecki, J. Mirkowski, T. Olszewski;
Nov. 01, 2010 – Mar. 31, 2014
Funded by the National Centre for Research and Development

The aim of the project is the design and prototype ET(V4) electrical capacitance tomograph with the application needed in the 3D imaging of dynamic processes.

[Pro16] **Design and Optimization of Radiation Detectors Sub-THz based on MOS Transistors** (Projektowanie i optymalizacja detektorów promieniowania sub-THz zbudowanych w oparciu o tranzystory MOS).
Wojciech Gwarek;
OPUS project
Mar. 01, 2013 – Mar. 01, 2016
Funded by the National Science Center

The main goal of this project is to take a systematic attempt to describe the phenomena occurring in the silicon detector sub-THz radiation consisting of a MOS transistor with an integrated antenna, taking into account the description of the phenomena occurring not only in the channel of the transistor but also in the surrounding fields contact and even wire connections is crucial for effective design of future experiments this area of knowledge. As a tool for conducting such analyzes, it is proposed to build electromagnetic (EM) coupled model based on FDTD algorithm.

[Pro17] **Graphene Pastes and Inks for Printing Conductive Paths and Layers for Document Protection** (Grafenowe pasty i atramenty do drukowania ścieżek i warstw przewodzących w zastosowaniu do zabezpieczenia dokumentów GRAFINKS).
Wojciech Gwarek, B. Salski, P. Kopyt, M. Olszewska-Placha;
Jun. 01, 2013 – Dec. 31, 2015
GRAF-TECH
Funded by National Centre for Research and Development

The aim of the project is to elaborate graphene pastes and inks compositions and technology. Graphene are suspended in a suitable solution of organic resin, designed to be applied on polymer substrates, papers, textiles by means of printing techniques (e.g. screen printing, flexography, ink-jet printing and spray printing). Obtained layers exhibit very good electrical and thermal conductivity, exceptionally high mechanical resistance (e.g. to bending) and elasticity, optical transparency and good absorption of microwave radiation after thermal or UV curing. The project is realized by a consortium consisting of the Faculty of Mechatronics, Warsaw University of Technology (WUT), the Institute of Electronic Materials Technology, the Institute of Radioelectronics (Faculty of Electronics and Information Technology, WUT) and the Polish Security Printing Works as an industrial partner.

[Pro18] **Development of a Prototype Radar Fire Control Multi-phase Scanning Beam in Two Planes for a Set of Medium-range Missile OP, Codenamed Vistula** (Opracowanie prototypu radaru wielofunkcyjnego kierowania ogniem ze skanowaniem fazowym wiązki w dwóch płaszczyznach dla zestawu rakietowego OP średniego zasięgu, kryptonim WISŁA).
Wojciech Wojtasiak, D. Gryglewski;
Jan. 28, 2013 – Dec. 18, 2020
Funded by the National Centre for Research and Development

The main goal of this project is to design a conception and project of N/O module with 10 W element radiating at X band, taking into account the limitations of raster scanning antenna radiating elements in a wide sector in both planes.

[Pro19] **Computed Medical Image Understanding based on Integration of Signals Acquisition, Information Representation and Knowledge Models** (Komputerowe rozumienie obrazów medycznych przez integrację akwizycji sygnałów, reprezentacji informacji i modeli wiedzy).
Artur Przelaskowski, W. Smolik, R. Sikora, R. Jóźwiak, M. Jasionowska;
Aug. 30, 2012 – Aug. 29, 2014
Funded by the National Science Center

The aim of research was an effective solution to the problem of computer image understanding related to the requirements of medical diagnosis. State of knowledge in this area would be developed by studying the possibility of integration of semantic representation of information with formalized model of specific domain knowledge and subjective model of reality cognition depicted by the specialists. Our intention was constructing semantic models at each stage of information transfer at different levels of abstraction. The goal closed the loop of semantic feedback starting form image data measurement methods through approximation of information transfer up to the effect of presented content perception with synergistic effect of imaging reality cognition depicted by the user.

[Pro20] **Microwave S band HEMT Transistor based on AlGaN/GaN Heterostructures Grown on Bulk Monocrystalline GaN Substrates** (Tranzystory mikrofalowe HEMT AlGaN/Ga na monokrystalicznych podłożach GaN).
Wojciech Wojtasiak;
Dec. 07, 2012 – Oct. 31, 2015
Funded by the National Centre for Research and Development

This project is carried out at the Institute of Electron Technology, Ammono S.A., Institute of High Pressure Physics Polish Academy of Sciences, Top-Gan Ltd., Institute of Physics Polish Academy of Sciences. The objective of this project is to research and develop a new type of microwave S band HEMT transistor based on novel AlGaN/GaN heterostructures grown on bulk monocrystalline semiinsulating GaN substrates. The substrates will be fabricated by ammonothermal method and their size scaled for 1" to 1.5". Two techniques - MOVPE and MBE will be used for the epitaxial growth of HEMT structures with high concentration and high mobility electron 2D gas, and improved structural quality. The fundamental approach behind the workplan is based upon the interaction between four key technical areas of expertise: (i) HEMTs modelling and design, (ii) material growth and characterisation, (iii) devices fabrication and (iv) packaging and chip assessment. A number of specific processing steps will be optimised including the definition of the active device area, RIE/ICP etching for ohmic contacts and gate recessing, through-wafer via holes fabrication.

[Pro21] **Multi-Pixel THz Radiation Detector with Selective MOS Transistors and its Application in Biology, Medicine and Security Systems** (Wielopikselowy detektor promieniowania THz zrealizowany z wykorzystaniem selektywnych tranzystorów MOS i jego zastosowanie w biologii, medycynie i systemach bezpieczeństwa).
Paweł Kopyt, W. Gwarek;
Nov. 13, 2012 - Oct. 31, 2015
Funded by the National Centre for Research and Development

This project is elaborated in the co-operation with Institute of Electron Technology, Warsaw University, Military University of Technology, Military Medical Institute. Based on results of research project (Design and realization of sub-THz radiation detector based on MOSFET), the proposers submit a project aimed at development, realization and validation of a multi--pixel THz radiation detector. A single pixel of the detector is a MOS transistor with a planar antenna responsible for ensuring frequency selectivity of the complete device. A pixel contains also a low-noise integrated amplifier. It is planned that the detector will consist of 10 – 15 such pixels. The device realized as a project result will also contain a conventional source of THz radiation (globar), optics as well as read-out circuitry for registering detection signals from all the pixels and software for data analysis. Such a device will become useful in identifying materials with characteristic spectra in the THz frequency band. Within the project framework measurements of spectra important in the areas of biology, medicine and security are to be performed.

[Pro22] **The Non-invasive System for Monitoring and Analysis of Electricity Consumption in the Area of the End-user** (Nieinwazyjny system monitorowania i analizy zużycia

energii elektrycznej w obszarze użytkownika końcowego).
Wiesław Winiecki, R. Łukaszewski, K. Liszewski, R. Kowalik, P. Bilski, A. Buchowicz, T. Keller, P. Olszyna;
NIALMON
Nov. 01, 2013 – Oct. 31, 2015
Funded by the National Centre for Research and Development

The aim of the project is to develop and verify a model of the system, which will enable non-invasive monitoring and analysis of energy consumption in the area of end-user using the data from one main energy meter. The system uses a method of automatic identification electricity consumers (marked: OEE), allowing it to out of the total energy consumed in the apartment could be isolated portion of the energy used by individual consumers. The main element of the system is an intelligent analyzer economical energy consumption (central processing unit). Through direct communication with the main counter, the system will have information about the total energy consumed in the apartment, and the use of these algorithms to identify OEE, based on specific profiles OEE, will be able to identify the individual OEE. The system will be able to analyze information, process and visualize them to the user on different devices.

[Pro23] **Wideband Radiocommunication Recorder** (Szerokopasmowy rejestrator radiokomunikacyjny).
Józef Modelski, W. Wojtasiak, D. Rosołowski, P. Korpas, T. Kosiło, K. Snopek, D. Gryglewski;
Dec. 20, 2013 – Dec. 19, 2016
Funded by the National Centre for Research and Development

Within the first stage of this project have been elaborated theoretical conceptions containing the various modular construction concept technology of demonstrator. These analyses provide the basis for the adopted solutions based on laboratory models.

4.2.4. Ph.D. grants

[Pro24] **Motion Estimation in Magnetic Resonance Imaging** (Metoda badania ruchu mięśnia sercowego przy użyciu technik rezonansu magnetycznego).
Konrad Andrzej Werys;
Oct. 01, 2014 – Oct. 01. 2015
ETIUDA 2

The aim of this project is the development of tool to validate motion estimation methods in magnetic resonance imaging. Second objective is an attempt to develop a new motion estimation method and its validation.

4.3 Projects granted by the University

4.3.1 Statutory projects

[Pro25] **Design and Investigation of Electroacoustic Measuring Systems and Digital Audio Signal Processing Systems** (Projektowanie i badania systemów elektroakustycznych oraz systemów cyfrowego przetwarzania sygnałów fonicznych)
Jan Żera, Z. Kulka, P. Bobiński, E. Kotarbińska, A. Leszczyński, M. Lewandowski, M. Tajchert;
Jun. 01, 2013– Nov. 30, 2014

The aim of the first work is to identify which groups of musicians in wind and symphony orchestras are most likely to be at risk of excessive exposure to sound. Sound pressure levels (SPLs) were measured among students playing in orchestras of the Fryderyk Chopin University of Music in Warsaw. Observed levels were compared to maximum levels allowed by the regulations on the noise exposure at workplaces. The findings indicate that the exposure value is strongly related to the instrument, the placement in the orchestra and the repertoire. The greatest risk of exposure to sound above allowable limits was found at musicians playing brass and percussion instruments. In the second task the aim was to determine the audibility of lossy compression introduced by different audio codecs. In the experiments, the percentage of correct discrimination of compressed sound samples was determined as a function of the bit rate. The main goal was to measure the effect of subjects' listening pre-training in lossy compression discrimination. This experiment involved 24 listeners of sound engineering. Samples of classical and pop music were used in all experiments. The results demonstrated considerable differences for different listeners. Students with hearing training noticed changes for sound at higher bit rate of about 16 kb/s.

[Pro26] **Advancement in the Design Methods of Stationary and Distributed Measurement Systems** (Rozwój metod projektowania stacjonarnych i rozproszonych systemów pomiarowych).
Wiesław Winiecki, P. Bilski, P. Czernik, R. Łukaszewski, K. Mroczek, J. Olszyna;
Jun. 01, 2013– Nov. 30, 2014

The presented project included the critical overview of the modern computer-aided methods for the virtual instrumentation and measurement systems design. The state-of-the-art considering the energy transfer relays management and monitoring of the electrical energy consumption was prepared. The legal aspects of implementing the intelligent measurements in the energetics were considered. The thorough review of the new fundamental terms and concepts being the paragon of changes in the modern energy (such as Smart Grid, Smart Metering, AMI, HAN or Smart Meter) was conducted. The idea of the modern telecommunication system for managing the transfer networks was considered. The overview of the home systems for monitoring the end-user electrical energy consumption (especially the non-intrusive counterparts) was prepared. The structure of the home-based non-intrusive energy consumption monitoring system using the central meter was proposed. Results of the presented research were presented in the invited lecture prepared for the „Computer-Aided Metrology" conference. Its extended version was published as the book chapter. The state-of-the-art about the development of the artificial intelligence methods in the diagnostics of analog systems was recognized as well. Selected artificial intelligence methods for fault detection and location were implemented to analyse the selected analog systems. Results of these research were presented in the DSc monograph, two papers in the JCR-listed journals and the international conference.

[Pro27] **Techniques for Modelling the Electromagnetic and Thermodynamic and De-**

sign of Microwave and Optoelectronic Circuits (Techniki modelowania elektromagnetycznego i termodynamicznego oraz projektowania układów mikrofalowych i optoelektronicznych).
Wojciech Gwarek, T. Morawski, S. Rosłoniec, M. Celuch, D. Gryglewski, P. Kopyt, P. Miazga, M. Sypniewski, A. Więckowski, W. Wojtasiak, D. Rosołowski, B. Salski, P. Kończak, M. Olszewska-Placha, M. Lubiejewski;
Jun 01, 2013 – Nov. 30, 2014

The project concerned methods of analysis and design of circuits destined for microwave and optocelectronic circuits. An important course of action is to incorporate the work on the modernization of the Polish industry radar. The work on modelling of quasi-THz detection on MOS transistor junctions proceeded and is scheduled for continuation.

[Pro28] **Modern Techniques in Nuclear and Medical Electronics** (Nowoczesne techniki elektroniki jądrowej i medycznej).
Krzysztof Zaremba, P. Bogorodzki, P. Brzeski, G. Domański, M. Dziewiecki, T. Jamrógiewicz, B. Konarzewski, R. Kurjata, J. Marzec, T. Olszewski, E. Piątkowska-Janko, D. Radomski, B. Sawionek, W. Smolik, R. Szabatin, M. Ziembicki, W. Gradkowski, J. Kryszyn, W. Obrębski, A. Rychter, K. Werys;
Jun. 01, 2013 – Nov. 30, 2014

Digital filing system for medical image data
The aim of this work was to implement a system to archive and transfer of image data in the Department of Nuclear and Medical Electronics (ZEJM). For this purpose, has been planned installation and configuration, and deployment on a single server platform XNAT Department.
As part of the work was performed:

- analysis of existing solutions
- sets out requirements for the system being installed

Analysis of technical requirements for computed microtomography system
X-ray computed microtomography is a high resolution imaging method where individual projections (radiographs) recorded from different viewing directions are used to reconstruct the absorption coefficient distribution. Main application of X-ray computed microtomography is an examination of small biological objects, insects for example. Analysis of technical requirements for computed microtomography system were carried out. X-ray tube with microfocus is expected x-ray source. Digital flat panel made of amorphous silicon and scintillator is expected X-ray image sensor. The scintillator is the converter of X-ray energy to visible light that irradiates amorphous silicon photodiode matrix.

Electrical tomography technique in medicine and industry
This year, work on the subtopic of statutory task was carried out:

- Development of switchless methods for capacitance measurement of atto-femtofarads in the field of electrical capacitance tomography;
- Development of software for high-speed data transmission for new electrical capacitance tomograph ECTV4;
- Testing of (CdMn) detectors for a hand-held mini-gamma camera dedicated for cancer surgery;
- Research on magnetic nanoparticles tomography.

At the same time the research in the field of molecular imaging techniques were continued.

[Pro29] **The Analysis of Architecture of Terrestrial Digital Television DVB-T2 Standard** (Analiza architektur uniwersalnego odbiornika cyfrowego telewizji naziemnej standardu DVB-T2).
Józef Modelski, K. Kurek, T. Keller, M. Dąbrowski, M. Darmetko, K. Derzakowski;
Jun. 01, 2013 – Nov. 30, 2014

The aim of the work was to analyse the possible architectures of terrestrial digital television DVB-T2 receivers, with particular emphasis on solutions allowing for high quality reception and compatibility with all the options of DVB-T2 and DVB-T standards. The differences between both standards have been described. Then an analysis of minimum signal to noise ratio, necessary to proper signal reception and the different implementations of the RF front ends of the receiver have been presented.

[Pro30] **Determination of the Dynamic Parameters of Measurement Setup in Millimeter and Sub-Teraherz** (Określenie parametrów dynamicznych stanowiska do pomiarów w paśmie milimetrowym i subterahercowym).
Yevhen Yashchyshyn, P. Bajurko K. Derzakowski, A. Łysiuk, K. Godziszewski, G. Bogdan, P. Piasecki;
Jun. 01, 2013 – Nov. 30, 2014

The aim of the project is determination of the effect of imperfect performance of multilayer structures on the accuracy of material characterization by using of the simulation and experimental verification. It be taken into consideration a number of different aspects of technology, including the effect of metallization thickness and the presence of air layers between the individual elements of the structure. As the structure under studies is a system for the polarization of ferroelectric materials. As part of the work it be carried out simulation studies of the static electric field distribution inside the structures characterized by various imperfections. The development of appropriate measurement procedures and the extraction of material properties on the basis of the measurements will be required.

[Pro31] **Investigation of Localization Algorithms Used in UWB Positioning Systems** (Przeprowadzenie badań algorytmów określania położenia w ultraszerokopasmowych systemach lokalizacyjnych).
Jerzy Kołakowski, J. Cichocki, R. Michnowski, K. Radecki, W. Kiełek, S. Żmudzin, A. Badawika, P. Ziętek;
Jun. 01, 2013 – Nov. 30, 2014

Investigations performed within the project were focused on the selection of positioning algorithm intended for implementation in a UWB positioning system. Two algorithms, Chan's and Foy's, were selected and investigated in a simulated environment. Additionally, algorithms verification with the use of measurement results collected with a UWB positioning system demonstrator was performed. The modification of localization system architecture con-

sisting in the use of synchronized infrastructure node pairs was proposed. The solution provides reduction of infrastructure required for system synchronization. A new positioning algorithm taking into account proposed modifications was developed.
Simulation and experimental investigations were carried out in order to test algorithm properties.

[Pro32] **Improving the Topology and Methods of Analysis and Design of Linear and Switched H.F. Power Amplifiers** (Doskonalenie układów, metod analizy i projektowania liniowych i kluczowych wzmacniaczy mocy wielkiej częstotliwości).
Juliusz Modzelewski, H. Chaciński, W. Kazubski, T. Kosiło, M. Mikołajewski;
Jun. 01, 2013 – Nov. 30 2014

In the work an analysis of the influence of parasitic reactances of transformers and power transistors on the frequency response of a push-pull transformer Class AB amplifier is given. It has been shown that in the amplifier a uniform frequency response and high efficiency in the HF, VHF, and UHF range can be obtained by applying in the input and output circuits of the amplifier wide-band transformers wound on ferromagnetic cores with matched transmission lines. The transformer in the output circuit of the amplifier is composed of 2 or 3 elementary transformers wound with a transmission line on a carbonyl core. The input circuit transformer can be made as a single elementary transformer wound on a ferrite core. A method that takes into account leakage inductances of the transformers and output capacitances of power transistors to obtain a flat frequency response in the amplifier in the UHF range has been also presented.

An experimental wide-band linear 20W 26-29 MHz power amplifier was modified, improved and tested. Inexpensive switching IRF 510 transistors were applied in the amplifier. To achieve a low level of non-linear distortions a pair of the transistors with possibly similar static characteristics was selected out of a number of transistors. The built amplifier has a linear transfer characteristic but its power efficiency and power gain are lower than in amplifiers built with transistors dedicated for applications in h.f. power circuits. An analysis of the operation of a high-efficiency Class E amplifier with an isolation and matching leakage transformer is given. The analysis has resulted in relationships defining the basic parameters of the amplifier such as: its output power, maximum values of the voltage and current in the transistor switch and the values of the resonant circuit components. Based on the analysis results a design procedure for the transformer Class E amplifier has been described.

The procedure was verified by designing and building a 100 W/300 kHz Class E amplifier. Experimentally obtained parameters for the built circuit agreed well with their theoretically predicted values. Measured efficiency of the amplifier was 95%. It has also been shown that by applying a transformer with high leakage inductances in the Class E amplifier it is possible to reduce significantly the number of inductive components in the amplifier from three (supply choke, resonant inductor and isolation transformer) to only one - the transformer. This can both simplify the amplifier circuit and lower its cost. Moreover, a method to calculate transistor power losses and values of resonant circuit components in a Class DE amplifier operating in nominal and off-nominal conditions has been proposed. The method is a result of the amplifier analysis made during the previous projects.

[Pro33] **Investigation on Multidimensional Signals, Diagnostics and Networks** (Badania w zakresie sygnałów wielowymiarowych, metod diagnostyki i sieci).
Jacek Wojciechowski, S. Kozłowski, K. Snopek, A. Bilski;
Jun. 01, 2013 – Nov. 30, 2014

Theoretical studies and computer simulations of hypercomplex analytic signals
This project was a continuation of the research in the field of 2-D (quaternion) and 3-D (octonion) hypercomplex analytic signals. The main result is the definition of the Octonion Fourier Transform (OFT) and its relation to the 3-D complex Fourier transform. Possible applications to image analysis have been pointed out. It has been observed in the 2-D image analysis that the brightness changes of a RGB image influence its quaternion polar components.
The results of this and previous years research in the field were submitted as a monograph in partial fulfillment of DSc requirements.

A metod for selection minimal number of diagnstics nodes in coplex analog systems
The work introduces a strategy for finding minimal set of test nodes for diagnostics of complex analog systems with single parametric faults, using SVM classifier as a fault locator. The results of diagnostics of a video amplifier and a low-pass filter using tabu search and GA algorithms as node selectors in conjunction with SVM fault classifier are presented. Diagnostic results show increase in the probability of fault location in diagnosed objects and verify the usefulness of the method and its computational requirements. As a secondary aim the classification efficiency of the kNN classifier was studied in conjuction to the already used ANN methods. The optimal *k* parameters proper for the task were found.

Spectrum sensing algorithms for cognitive radio systems.
This research aims at a cyclostationary detectors suitable for the DVB-T signals. Selected detectors have been investigated by means of the computer simulations. A selected detector has been implemented in the measurement set-up comprising software-defined radio (SDR) module operating as an RF front-end and downconverter, as well as a personal computer running Matlab as a signal processing device. The detector properly senses signals in chosen TV channel (522 MHz) at SNR level as low as -15 dB. The results have been reported in the paper submitted to IET Communications.

Research in cyclic graphs
This research extends the class of circulant graphs and introduces the classes of undirected and directed bipartite bicirculant graphs. Circulant and bicirculant graphs may serve as models of communication networks. Algebraic tools used in the analysis of circulants are redesigned and engaged to the analysis of bipartite bicirculants. Connectivity condition is formulated. A matrix description for these graphs is introduced and properties of the matrices are investigated. A technique for effective calculation of eigenvalues is introduced and the pattern of eigenvalues on the complex plane given. A closed form formula for determining the number of spanning trees in undirected bipartite bicirculant graphs is introduced. It is also proven for directed graphs that

the numbers of spanning in-trees or out-trees w.r.t. certain subsets of vertices are identical. The results of he research were submitted for publishing in "Networks".

[Pro34] **Interpretation of Measurement Data – Methodology and Metametrological Aspects** (Interpretacja danych pomiarowych – metodyka i aspekty meta-metrologiczne).
Roman Z. Morawski, A. Miękina, A. Podgórski;
Jun. 01, 2013 – Nov. 30, 2014

The primary objective of the project is related to the methodological and organisational aspects of metrology, in particular of the design and implementation of algorithms for calibration of measurement channels and reconstruction of measurands (*i.e.* generalised quantities to be measured); the project is also aimed at upgrading the corresponding research infrastructure (both hardware and software). The results of the project include: a methodology for designing algorithms for processing data from various transducers, as well as some contributions to the explanation of the role of measurement in providing safety and security. The results of the research accomplished have been presented at two conferences.

[Pro35] **Audiovisual Network Hybrid Systems** (Audiowizualne sieciowe systemy hybrydowe).
Krystian Ignasiak, W. Skarbek, A. Buchowicz, G. Galiński, J. Naruniec, G. Pastuszak, M. Jakubowski, M. Jędryka, M. Leszczyński, A. Nowakowski, A. Abramowski, G. Brzuchalski, M. Roszkowski, M. Wieczorek;
Jun. 01, 2013 – Nov. 30, 2014

The work was the continuation of the development of elements of the new system for digital TV coding including audio and video compression circuits based on the MPEG-4 (H.264/AVC and AAC) standard. Within the works, some functional blocks of a software video coder for H.264/AVC were developed based on the modularity concept. Getting fast hardware realizations of audio and video coding algorithms and their implementation in FPGA devices enable the verification of the algorithms in real-time conditions. Particularly, hardware PCB devices were used to validate designs. They include FPGA coupled external memories, ADC/DAC audio/video converters, and supply circuits. The design methodology of audio/video coding was developed for some key codec elements. In particular, the concept of adaptive video coding applied to the motion estimation unit has been enhanced to double the throughput. As for audio coding, the AAC encoder was evaluated with different psychoacoustic models. Codecs implementation efforts tend to the creation of a system of network reconfigurable audio-video nodes, which would allow the demonstration of efficiency and usefulness of particular hardware-functional profiles in distributed real-time audiovisual systems.

4.3.2. Projects granted by the Dean

[Pro36] **Implementation and Testing of a Radio System using Time Modulated Antenna Arrays and a Module of Software Defined Radio** (Realizacja i badanie systemu radiowego wykorzystującego szyki antenowe z modulacją czasową i moduł radia programowalnego).
Rafał Bajurko;
May 30, 2014 – Mar. 31, 2015

The scientific goal of the project was the implementation of a radio system employing time modulated antenna array and a module of programmable radio (SDR - Software Defined Radio). The system allows experimental studying the feasibility of simultaneous processing of the data stream transmitted by a radio channel and performing antenna array control algorithm.

[Pro37] **Development of Short-term Parameters of the Digital Sigma-Delta Modulators with the Use of Speech and Musical Signals and Auditory Evaluation of Modulator's Output Signals** (Stanowisko laboratoryjne przeznaczone do badania właściwości czasowych cyfrowych modulatorów sigma-delta pobudzanych sygnałami mowy i muzyki oraz oceny słuchowej sygnałów wyjściowych badanych modulatorów).
Marcin Lewandowski;
May 30, 2014 – Dec. 31, 2014

The aim of this work was to develop a system for a short-term performance analysis and evaluation of digital sigma-delta modulators with the use of non-stationary audio signals, such as speech and musical signals, at the input.

[Pro38] **Development of Algorithms and Laboratory Stand for Creating Non-Rigid 3D Shape and Texture Models of Faces** (Opracowanie algorytmów i stanowiska do budowania 3W niesztywnych modeli kształtu i tekstury twarzy).
Jacek Naruniec;
May 30, 2014 – Feb. 28, 2015

The purpose of this project is to develop algorithms and positions to build 3D models of non-rigid shape and texture of the face. Developed models will be used in a number of image processing algorithms, which deals with the Television Division, at the Institute of Radioelectronics, WUT.

[Pro39] **Inductive Sensor for Non-destructive Inspection of Carbon Composites** (Czujnik indukcyjny do badania nieniszczącego kompozytów węglowych).
Bartłomiej Salski;
Nov. 12, 2014 – Jun. 30, 2015

Previous studies directed by the Applicant in the project FP7- CompHealth (Radio Frequency Sensing for Non-Destructive Testing of Carbon Fibre Reinforced Composite Materials for Structural Health Monitoring), carried out at the Institute of Radioelectronics, WUT, led to the development of an an innovative non-destructive inspection method of carbon composites, which act a key role in the modern aerospace industry and beyond. Due to the advantages of the proposed method, such as the ability to inspect curved surfaces or a significant reductionof the inspection time of large surfaces, this proposed method has great potential for development and practical application. Through the efforts of the authors of this solution, all rights of ownership on the sensor remain in the hands of the authors and the Warsaw University of Technology. However, the next

stage of the research focused on expanding the range of applications of the proposed method non-destructive inspection is necessary.

[Pro40] **Modernization of Measurement Setup for Material Characterization in Sub-Terahertz Range to Increase the Accuracy of Measurements** (Modernizacja stanowiska do badań materiałów w zakresie subterahercowym dla zwiększenia dokładności pomiarów).
Konrad Godziszewski;
Nov. 12, 2014 – Jun. 30, 2015

The aim of the project is to increase the accuracy of measurements by modernization of setup for material characterization in sub-terahertz frequency band. Developed setup will allow to determine material properties, including complex permittivity, with very high precision in frequency range up to 0.5 THz. New equipment will also enable to create new measurement methods, which will contribute to development of material characterization in very high frequencies.

4.4 Other projects

[Pro41] **Design, Implementation and Investigation of Antennas at 5.2-5.9 GHz Band** (Projekt, realizacja i badanie anten na pasmo 5.2-5.9 GHz).
Yevhen Yashchyshyn, P. Bajurko, K. Godziszewski;
Dec. 01, 2013 – Mar. 31, 2014
Funded by CAMSAT, Gralak Przemysław
The main goal of this project was to design, implement and increase the investigation of the antennas working at 5.2-5.9 band.

[Pro42] **Imaging Study using MRI Techniques Implemented in the Framework of Joint Research Topic: Small Animal Brain Morphometry** (Badanie obrazowe z wykorzystaniem techniki MRI w ramach realizowanego wspólnie tematu badawczego: Morfometria mózgu małych zwierząt).
Piotr Bogorodzki, E. Piątkowska-Janko;
Jan. 20, 2014 – Jan. 20, 2015
Funded by SGGW (Warsaw University of Life Sciences).

This project is carried out at the Faculty of Veterinary Medicine, Warsaw University of Life Science. The objective of this project is to conduct researches on small animal brain by means of MRI techniques.

[Pro43] **The Prototype System based on Electrical Capacitance Tomography and Optical Detection to Optimize Production and Quality Control** (Prototyp systemu oparty na elektrycznym tomografie pojemnościowym oraz optycznej detekcji do optymalizacji i kontroli jakości produkcji).
Roman Szabatin, P. Brzeski, W. Smolik, T. Olszewski;
Jan. 30, 2014 – Sept. 30, 2015
Net-art Paweł Rymarczuk

The research project assumed creation of two measurement platforms: a set of multiphase flow system and a mini production line. In the first case two-phase flows of liquid (water) and air were analysed. The type of flow was commonly used in chemical reactirs where air was mixing substances. In the second case, was analysing moving objects on the mini production line using RFID tags and image detecton techniques. The system would be also using biometric reader's witches would provide access control.

[Pro44] **Measurements of Transfer Frequency Characteristics with Sinusoidal Stimulation and Pink Noise in One-Third Octave Bands. Measurements of TPD + N Distortion as a Function of Frequency and Amplitude** (Pomiary charakterystyk przenoszenia (częstotliwościowych) przy pobudzaniu sinusoidalnym i szumem różowym w pasmach tercjowych. Pomiary zniekształceń TPD+N w funkcji częstotliwości i w funkcji amplitudy).
Andrzej Leszczyński, P. Bobiński, M. Lewandowski;
Jun. 04, 2014 – Sept. 04, 2014
Funded by PYLON S.A.

Details of the project cannot be published due to non-disclosure argeement with contractor.

[Pro45] **Cooperation with Samsung Electronics Poland Ltd. within the Framework of a Face Detection and Frontalization Project** (Współpraca z firmą Samsung Electronics Polska sp.z.o.o. w realizacji projektu: Face Detection and Frontalization).
Jacek Naruniec, W. Skarbek;
Jul. 10, 2014 – Dec. 01, 2014
Funded by Samsung Electronics Polska Ltd.

The aim of the project was to refine the results of the face detection algorithms developed in our previous work with Samsung R&D (WebCam Eye Tracking).

[Pro46] **Supply of Specialized Equipment and Computer Software for the Centre for Information Technology, Technical University of Lodz** (Dostawa sprzętu specjalistycznego komputerowego oraz oprogramowania dla Centrum Technologii Informatycznych Politechniki Łódzkiej)
Roman Szabatin, P. Brzeski, W. Smolik, T. Olszewski;
Jul. 11, 2014 – Nov. 10, 2014
Funded by Łodz University of Technology (Politechnika Łódzka)

The main goal of this project was to develop and construct the instrumentation for medical researches.

[Pro47] **The Technical Analysis, Presentations and Lectures, for Employees of Samsung Electronics Poland Ltd.** (Analiza techniczna w formie prezentacji oraz wykładów przeznaczonych dla pracowników firmy Samsung Electronics Polska sp.z.o.o.).
Jacek Naruniec, M. Kowalski;
Oct. 08, 2014
Funded by Samsung Electronics Polska Ltd.

Details of the project cannot be published due to non-disclosure argeement with contractor.

4.5 Other activities

4.5.1 Scholarship for the outstanding young scientist granted by the Ministry of Science and Higher Education

Grzegorz Pastuszak;
Nov. 29, 2011 – Nov. 28, 2014

The scholarship is dedicated for the research on efficient hardware implementations for algorithms encoding/decoding audiovisual data. Developed architectures should allow real-time high-resolution processing for low latency, multi-source signals (multi-channel audio and multi-view video), and high--efficient compression. The architectures are mapped into FPGA devices to obtain acceleration.

4.5.2 Scholarship for the outstanding young scientist granted by the Center for Advanced Studies WUT

Bartłomiej Salski;
Dec. 5, 2012 – Dec. 5, 2014

The scholarship is dedicated to both theoretical and experimental research on electromagnetic properties of graphene, and its potential applicability to control conductive properties of polymer composites with graphene inclusions.

4.5.3 Partnership

4.5.3.1 International Co-operation

Scalable Training Program in Auditory Situation Awareness and Sound Source Signature Identification (Program szkolenia w zakresie orientacji słuchowej i identyfikacji dźwięku).
Co-operative Research and Development Agreement between US Army Research Laboratory (ARL) and the Warsaw University of Technology, the Electro-acoustics Division
Jan Żera – co-ordinator
Oct. 1, 2013 – Aug. 1, 2015

The purpose of the project is to determine whether systematic training in the auditory assessment of sound can improve a listener's ability to identify everyday and military sounds. In particular, the project seeks to examine whether people who received training in the auditory assessment of sound or have previous music experience show a greater ability In recognizing everyday sounds, identifying acoustic signatures of specific sound sources, and reporting the sonic characteristics of short impulse sounds, such as weapon fire, explosions, impact crashes, shouts for help, etc. The long term goal of the proposed study is to develop a sound identification program tailored specifically for industrial and military applications.

COST IC1101 - Optical Wireless Communications - An Emerging Technology (OpticWise)
Y. Yashchyshyn – MC member
2012-2015

This COST Action serves as a high-profile consolidated European scientific platform for interdisciplinary OWC research activities, spanning from characterization of diverse propagation media to modeling, design and development of devices, components, algorithms/protocols and systems. It makes significant contributions to the fundamental scientific understanding, technical knowledge, engineering design and applications while promoting community awareness of this emerging field. Development of novel and efficient communication technologies resulting from integrated research activities made possible through this Action is a significant enabler for future-generation hetero-geneous communication networks supporting a wide range of wireless services/applications.

COST IC1102 - Versatile, Integrated, and Signal-aware Technologies for Antennas (VISTA)
Y. Yashchyshyn – MC substitute member
2012-2015

This COST Action identifies key research topics, facilitating the networking and coordination between different R&D teams. The objectives are to assess the needs for the new technologies and applications, to foster the development of radiating systems in green, smart environments, to provide the necessary supporting technologies and to promote the career start of young researchers.

4.5.3.2 International Co-operation

CC-Link

Since 12 May 2005 the Institute of Radioelectronics has been a formal member of the CC-Link Partner Association – the world-wide organization of industrial and research institutions working on the development and applications of CC-Link (Control & Commu-nication Link) – a field network system that processes both the control and information data at high speed, to provide efficient integrated factory and process automation. The collaboration with the Association is realized by the Division of Nuclear and Medical Electronics.

4.5.3.3. National Co-operation

MultiShow Cluster

The Institute of Radioelectronics has been designed a cross-regional initiative called: "MultiShow Solution for Sports & Leisure Facilities Cluster"; Partner - Polish Association for Sports and Leisure Facilities IAKS Polska is a professional adviser in the range of designing, building of sport and recreation facilities (among other things: project supervisions, preparing an expert opinion, conceptions, estimations, consultations, facilities inspections, and workshop procedures) and also their managing. The co-operation with IAKS is realized by the Division of Television.

IUSER

The new established science and technology platform: "Intelligent Devices and Systems for Distributed Power Generation" is carried out at Institute of Radioelectronics, Military University of Technology, National Institute of Telecommuni-cations, Military Communication Institute, National Chamber of Electronics and Telecomunications, TP SA., Institute of Electron Technology. The main aim of this project is to conduct the research on technologies and products, the implementation of which will create a market opportunity for the development of distributed generation based on renewable energy sources

Intelligent Transport

The new established science and technology platform is carried out at Faculty of Electronics and Information Technology (Institute of Radioelectronics,

Institute of Telecommunications), Faculty of Transport, Faculty of Administration and Social Sciences, Faculty of Automotive and Construction Machinery Engineering. The main aim of this project is to realize the scientific researches in the field of telecommunication and information systems and methods of information in an intelligent transport.

4.5.4 Scientific networks

Polish Network of Neutrino Physics
(Polska Sieć Neutrinowa)

In 2006, the Faculty of Electronics and Information Technology joined the Polish Network of Neutrino Physics. The network compreses several institutes and laboratories working in the field of development of experimental neutrino physics. The Faculty is represented in the network by the Division of Nuclear and Medical Electronics, which has a long-term experience in collaboration with high energy physics (NMC, SMC, COMPASS) and neutrino physics (ICARUS, T2K) experiments.

Polish Network of Particle Astrophysics
(Polska Sieć Astrofizyki Cząstek)

In 2006 the Faculty of Electronics and Information Technology joined the Polish Network of Particle Astrophysics. The main goal of the organization is to create a frame for the research collaboration of several institutes and laboratories in the field of development of advanced experimental methods for particle astrophysics. The Faculty is represented in the network by two researchgroups: from the Institute of Electronics Systems and from Institute of Radioelectronics – namely from the Division of Nuclear and Medical Electronics.

HyperMR - European Network for Hyperpolarization Physics and Methodology in NMR and MRI – TD1103

In 2012 the Faculty of Electronics and Information Technology, Institute of Radioelectronics (the Division of Nuclear and Medical Electronics) joined the project realized in the frame for the research collaboration of several Polish and foreign institutes. The main aim of this Action is to stimulate and accelerate collaborations and joint research efforts between European groups into hyperpolarization physics and methodology with the goal to develop robust strategies for sensitivity enhancement in NMR and MRI. Coordinated short-term scientific missions (STSMs) will make it possible to fully exploit the potential of unique scientific instrumentation which already exists in a number of European groups. The scientific programme is organised into 5 different working groups that focus on key issues related to the topic of the Action. The scientific programme is supported by a wide range of research groups thus generating a high added value for the European research landscape

4.5.5 Student research groups

Space Engineering Student Scientific Group
Krzysztof Kurek – tutor.

- Space Engineering Student Scientific Group – SKIK (in Polish Studenckie Koło Inżynierii Kosmicznej) was formed in 2004. Members of SKIK participated in different international and internal educational space projects. i.e. ESEO, PW-Sat, BOBAS balloon missions. Now, the group start activity with new members, preparing the next balloon mission.

Biomedical and Nuclear Engineering Student Scientific Group
Grzegorz Domański – tutor.

Biomedical and Nuclear Engineering Student Scientific Group (in Polish Studenckie Koło Inżynierii Biomedycznej i Jądrowej Biomedyczni – (http//www.ire.pw.edu.pl/biomedyczni) was formed was formed in Dec. 2005 by a group of students from Biomedical Engineering. The group worked on software enabling determination of longitudinal relaxation time on the basis of a series of images with different inversion time (TI). The "Arduino for biomedical applications" project has been initiated to develop student interests in the design of new electronic systems, software, and use them in biomedicine. The main objective of the project group is to get acquainted with the electronic platform Arduino programming environment for creating low-cost , flexible and easy- to-use devices. The acquired knowledge and skills will be use at a later stage of the project to develop and implement a multi-functional system for biomedical use, based on the Arduino platform and additional electronic components.

Innovative Information Technologies Student Scientific Group
Przemysław Miazga – tutor.

The scope of interest of the Students' Circle for Innovative Informatics Technologies (KNITI) is the application of .NET technologies in mobile devices programming.
In 2014 KNITI organized 3 courses for students of our university, two courses on basics of C# programming language (12 presentations x 2 hours each) and one course on advanced Windows 8 programming for mobile devices (10 x 2 hours) with over 250 participants. KNITI was also the co-organizer together with the Electric Faculty Informatics Student Circle of the Information Technology Academic Day (ITAD Nov. 20, 2014) conference with over 200 patricipants. Students of the Group participated in many programming events and contests eg. in Microsoft Imagine Cup, hack-atone Night of The Living Devs. The Circle is the organizer of K-Night LAN Party programming marathon.

MuGEd Student Scientific Group
Władysław Skarbek – tutor.

MuGEd Scientific Group (in Polish Koło Naukowe MuGEd) (www.ztv.ire.pw.edu.pl/muged) was founded in April 2011, at the Division of Television. The aim of the group is a modern approach to teaching and learning processes by using many kinds of Multimedia in Educational Games (MuGEd). This objective relates to such topics as computer graphics, artificial intelligence, and machine vision, Also, our projects are consulted with experts from other fields such as psychology and pedagogy. There is a feeling in the group, that the future belongs to mobile systems, hence the MuGEd works are dedicated to portable devices. The new vision of educational games, creating software for mobile systems and huge interdisciplinary of the work are the hallmarks of our Group.

4.6 Instrumentation investments

4.6.1 Centre for Biomedical Technology and Medical Physics

Nuclear and Medical Electronics Division (**Krzysztof Zaremba** – head)
2008 - 2014
Founded by European Regional Development Fund (ERDF) in scope of Operational Programme Innovative Economy (POIG).

The project is a part of the CePT (Centre for Preclinical Research and Technology) the biggest biomedical and biotechnological undertaking in Central and Eastern Europe. The CePT project is coordinated by the Medical University of Warsaw in partnership with the University of Warsaw, the Warsaw University of Technology and seven research institutes of the Polish Academy of Sciences. The main objective of the Centre is to establish the network of biomedical engineering and biomaterial technology laboratories which will form the base for scientific research and technology implementation. In this Project participates 8 faculties of Warsaw University of Technology. At present the Centre is in a phase of equipment purchasing and organization of laboratories.

4.6.2 Sub-terahertz Technology and An--tenna Laboratory

Yevhen Yashchyshyn, P. Bajurko
2010 – 2014
Founded by European Regional Development Fund (ERDF) in scope of Operational Programme Innovative Economy (POIG).

The project is a part of the Faculty Research Centre FOTEH (Photonics and Terahertz Technologies). The project encompasses modernizing of infrastructure of the Antenna Laboratory that enables research on spatial distributions of the electromagnetic field in the millimetre-wave and sub-terahertz range to develop and study of antennas, characterize parameter of materials and designing of the communication, imaging and radar systems.

5.TITLES AND DEGREES AWARDED

5.1. D.Sc. Degrees

[DSc1] Piotr Bilski: *"Artifical intelligence methods in the diagnostics of analog systems"*, Warsaw, May 27, 2014.

[DSc2] Waldemar Smolik: *"Rekonstrukcja obrazów w elektrycznej tomografii pojemnościowej"* (Reconstruction of the images in electrical capacitance tomography), Warsaw, Apr. 22, 2014.

[DSc3] Kajetana Snopek: *"Studies on complex and hypercomplex multidimensional analytic signals"*, Warsaw, Jun 24, 2014.

5.2 Ph.D. Degrees

[PhD1] Paweł Czernik: *"Analiza, modelowanie i realizacja fizycznych generatorów liczb losowych do zastosowań w rozproszonych systemach pomiarowych o asymetrycznych zasobach"* (Analysis, modeling and implementation of physical random number generators for distributed measurement systems with asymmetric resources), Prof. **W. Winiecki** (supervisor), Warsaw, Jul. 1, 2014.

[PhD2] Marcin Dąbrowski: *"Investigation of digital terrestrial television receiver architectures for DVB-T2 standard"*, Prof. **J. Modelski** (supervisor), Warsaw, Mar. 18, 2014.

[PhD3] Rafał Jóźwiak: "*Wieloskalowe metody reprezentacji treści diagnostycznej w obrazach medycznych"* (Multiscale methods of data representation in medical imaging), Prof. **A. Przelaskowski** (supervisor), Warsaw, Dec. 16, 2014.

[PhD4] Marzena Olszewska-Placha: *„Nowy typ paneli absorbujących fale elektromagnetyczne"* (New type of panels absorbing the electromagnetic waves), Prof. **W. Gwarek** (supervisor), Warsaw, Jun. 12, 2014.

[PhD5] Aneta Świercz: *"Model filtrów słuchowych a deskryptory MPEG-7 w rozpoznawaniu dźwięku"* (Model of auditory filters and MPEG-7 descriptors in sound recognition), Prof. **J. Żera** (supervisor), Warsaw, Dec. 18, 2014.

5.3. M.Sc. Degrees

[MSc1] Adam Bartosik: *„Analiza ograniczeń parametrów liniowych wzmacniaczy o mocy do 100 W w paśmie 1-30 MHz wynikających z właściwości tranzystorów mocy i elementów biernych"* (Analysis of limitations for linear amplifiers with power to 100 W in band 1-30 MHz resulting from properties of power transistors and passive elements), Assist. Prof. **J. Modzelewski** (supervisor).

[MSc2] Paweł Boguszewski: *"System lokalizacji w oparciu o bezprzewodową sieć komputerową WiFi"* (Location system based on computer wireless network WiFi), Assist. Prof. **R. Łukaszewski** (supervisor).

[MSc3] Krzysztof Jacek Borkowski: *„Opracowanie układu etykiety multilateralnego ultraszerokopasmowego systemu lokalizacyjnego"* (The development of tag for multilateral UWB localization systems), Assist. Prof. **J. Kołakowski** (supervisor).

[MSc4] Maciej Bucholc: *„Badania mechanizmów kodowania korekcyjnego w systemach telewizji cyfrowej"* (Error correcting codes in digital television systems), Senior Lecturer **T. Keller** (supervisor), M.Sc. degree with honours.

[MSc5] Michał Budka: *„Algorytmy steganograficzne w dziedzinie kompresji obrazu"* (Steganographic algorithms in compression domain), Prof. **W. Skarbek** (supervisor).

[MSc6] Patryk Ćwiek: *"Program do symulacji ugięcia rogówki"* (Cornea deformation simulation software), Assist. Prof. **G. Domański** (supervisor).

[MSc7] Wojciech Ferenc: *"Badania zniekształceń intermodulacyjnych urządzeń DOCSIS 3,1 w sieciach telewizji kablowych"* (The measurements of the second and third order intermodulation distortion in devices compliance with standard DOCSIS 3.1 of cable television), Senior Lecturer **T. Keller** (supervisor).

[MSc8] Marcin Góralczyk: *"Mikrofalowy monolityczny przełącznik N/O w technologii GaN HEM"* (Monolithic T/R switch in GaN HEM technology), Assist. Prof. **W. Wojtasiak** (supervisor), M.Sc. degree with honours.

[MSc9] Piotr Jan Górski: *"Analiza systemu do pomiaru zmian utlenowania techniką optyczną"* (Analysis of a system of the oxygen saturation change measurement using an optical method), Assist. Prof. **G. Domański** (supervisor), M.Sc. degree with honours.

[MSc10] Adam Grabowski: *„Implementacja układu sprzęgającego sieci CC-link w strukturach programowalnych"* (Implementation of CC--link network's coupling system in programmable logic), Assist. Prof. **R. Kurjata** (supervisor).

[MSc11] Marta Anna Kryńska: *„Analiza badań scyntygraficznych"* (Analysis of scyntigraphic studies), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[MSc12] Mateusz Krysicki: *"Poprawa dokładności symulacji elektromagnetycznej struktur o skomplikowanej geometrii metodą FDTD"* (Improvement of accuracy of electromagnetic FDTD simulation of structures with complex geometry), Prof. **W. Gwarek** (supervisor), M.Sc. degree with honours.

[MSc13] Dawid Łukasz Kuchta: *„Model DC tranzystora GaN HEMT z uwzględnieniem parametrów fizycznych"* (DC analytical model of AlGaN/GaN HEMT including

physical parameters), Assist. Prof. **D. Gryglewski** (supervisor), M.Sc. degree with honours.

[MSc14] Magdalena Kurzyp: *„Hierarchiczne nanostruktury węglowe osadzone na tkaninach z włókna węglowego jako platforma stosowana w biochemicznej filtracji i aplikacjach sensorowych"* (Hierarchical carbon nanostructures deposited on carbon fibre fabrics as a platform for biochemical filtration and sensor applications), Assist. Prof. **A. Werbowy** (supervisor).

[MSc15] Piotr Lewicki: *"Uniwersalny dwukanałowy blok akwizycji do odbioru klasy SDR"* (Universal two-channel acquisition block to receive SDR class), Assist. Prof. **D. Rosołowski** (supervisor).

[MSc16] Piotr Łuba: *„Internetowa platforma przechowywania i przetwarzania danych geotechnicznych w technologii JSP"* (Web platform for storing and processing geotechnical data in JSP technology), Assoc. Prof. **P. Bilski** (supervisor).

[MSc17] Dariusz Łutczyk: *"Lokalizacja twarzy w obrazach nieruchomych"* (Face localization in still images), Assist. Prof. **G. Galiński** (supervisor), studies in English.

[MSc18] Aleksandra Markowska: *„Badanie wpływu przygotowania powierzchni na własności fizyczne płytek (Cd, Mn)Te"* (Study on the influence of surface preparation on physical properties of (Cd, Mn)Te platelets), Assist. Prof. **R. Szabatin** (supervisor).

[MSc19] Mateusz Marszałek: *„System do pomiarów spektrometrycznego promieniowania jonizującego na platformie ARM"* (System for spectrometric measurement of ionizing radiation on a platform with ARM processor), Assist. Prof. **R. Kurjata** (supervisor).

[MSc20] Agnieszka Edyta Murgrabia: *„Mikroprocesorowy rejestrator narażenia na wolnozmienne i stałe pola magnetyczne pracowników opieki zdrowotnej"* (Microprocessor monitor of exposure to extremely low frequency and static magnetic fields of healthcare workers), Assist. Prof. **R. Kurjata** (supervisor).

[MSc21] Agnieszka Naplocha: *„Wolumetryczna wizualizacja danych medycznych z wykorzystaniem narzędzi webowych HTML5, JavaScript i WebGL"* (Volumetric visualization of medical data using web tools HTML5, JavaScript and WebGL), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[MSc22] Magdalena Oknińska: *„Aplikacja do obrazowania traktów istoty białej w mózgu na podstawie obrazów dyfuzyjnych MRI"* (The application for imaging of white matter tracts in the brain based on diffusion MRI images), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[MSc23] Paulina Osiak: *"Wykorzystanie łączy optycznych do synchronizacji węzłów w ultraszerokopasmowym systemie lokalizacyjnym"* (Synchronization of nodes in UWB localization system using optical link), Assist. Prof. **J. Kołakowski** (supervisor).

[MSc24] Katarzyna Paczkowska: *„Metoda identyfikacji modyfikacji potranslacyjnych białek na podstawie danych ze spektrometrii mas"* (The method of identification of post-translational modification of proteins from mass spectrometry data), Assist. Prof. **T. Rubel** (supervisor).

[MSc25] Mateusz Piejdak: *"Świetlny wskaźnik prezentacyjny z lokalizacją 2D"* (Light indicator with 2D localization for presentation purposes), Prof. **W. Skarbek** (supervisor).

[MSc26] Agnieszka Paula Pietrzak: *„Ocena ryzyka wystąpienia ubytków słuchu wśród studentów kierunków muzycznych"* (Assessment of the hearing loss risk among music students), Prof. **J. Żera** (supervisor).

[MSc27] Radosław Polak: *"Mikroprocesorowy rejestrator przyspieszeń biomechanicznych"* (Microprocessor recorder of biomechanical acceleration), Assist. Prof. **G. Domański** (supervisor).

[MSc28] Adam Raniszewski: *„Zrównoleglenie procesu obliczeniowego FDTD z wykorzystaniem procesorów graficznych"* (Parallelization of the FDTD calculation using graphics processing units), Assist. Prof. **M. Sypniewski** (supervisor).

[MSc29] Dominika Rogala: *„System do bezkontaktowego pomiaru temperatury ciała człowieka"* (Non-contact infrared themperature measurement system), Assist. Prof. **R. Kurjata** (supervisor).

[MSc30] Filip Rogowski: *"System bezdotykowego układania wirtualnej kostki Rubika za pomocą gestów rąk"* (System of touchless solving virtual Rubik's Cube with hands gestures), Assist. Prof. **J. Naruniec** (supervisor), M.Sc. degree with honours.

[MSc31] Piotr Rogowski: *"Rozproszony system testowania możliwości technologii Bluetooth w zakresie pozycjonowania wewnątrz budynków"* (Distributed testing system for indoor positioning using Bluetooth), Prof. **W. Winiecki** (supervisor).

[MSc32] Mateusz Różański: *„Implementacja usługi sieci NGN z wykorzystaniem chmury obliczeniowej"* (Implementation of NGN service using cloud computing), Reader **M. Średniawa** (supervisor).

[MSc33] Paweł Dominik Rudziński: *„Wielokanałowe urządzenie do monitorowania sygnału EKG"* (Multichanel ECG signal monitoring

device), Assist. Prof. **G. Domański** (supervisor).

[MSc34] Tomasz Rudzki: *„Badania właściwości akustycznych mikroperforowanych ustrojów dźwiękochłonnych i ich zastosowanie* do korekty akustycznej pomieszczeń" (Investigation of acoustical properties of microperforated panel absorbers and their application in acoustic treatment of halls for speech and music), Prof. **Z. Kulka** (supervisor).

[MSc35] Kamil Salman: *"Wykorzystanie technologii OpenCL do przetwarzania sygnałów dźwiękowych"* (Digital audio signal processing based on OpenCL), Prof. **Z. Kulka** (supervisor).

[MSc36] Radosław Sokołowski: *"Bezprzewodowy system przywoławczy do zastosowania w lokalach gastronomicznych"* (Wireless calling system for restaurants), Assist. Prof. **A. Podgórski** (supervisor).

[MSc37] Marlena Stalewska: *„Ocena stanu naczyń krwionośnych na podstawie badania krążenia obwodowego"* (Assessment of vessels condition based on the peripheral pulse waveform), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[MSc38] Olga Stankiewicz: *"Jednokanałowe urządzenie do pomiaru sygnałów bioelektrycznych"* (Single-channel device to measure bioelectric signals), Assist. Prof. **G. Domański** (supervisor).

[MSc39] Magdalena Stanowska: *„Wzorcowanie analizatora spektrofotometrycznego z regularyzowaną metodą najmniejszych kwadratów z preselekcją danych"* (Calibration of spectrophotometric analyser using Regularized Least Squares Method with data preselection), Assist. Prof. **A. Miękina** (supervisor).

[MSc40] Aleksander Stańczak: *"System umożliwiający interakcję człowieka z automatyką budynku"* (Human-computer interaction with building management system), Assist. Prof. **J. Naruniec** (supervisor).

[MSc41] Michał Stasiuk: *"Znakowanie wodne w obrazach cyfrowych"* (Watermarking for digital images), Prof. **W. Skarbek** (supervisor).

[MSc42] Adam Stelmaszczyk: *"DE/mid – nowy wariant algorytmu ewolucji różnicowej wykorzystujący punkt środkowy populacji"* (DE/mid – new variant of differential evolution algorithm using the midpoint of the population), Prof. **J. Arabas** (supervisor).

[MSc43] Adam Stolarczyk: *"Porównanie różnych realizacji aktywnych filtrów audio na podstawie konstrukcji studyjnych korektorów parametrycznego i graficznego"* (Comparison of diffrent implementation of active audio filters based on the construction of parametric and graphic equalizers), Senior Lecturer **P. Bobiński** (supervisor).

[MSc44] Mateusz Stosio: *„Architektura autonomicznego systemu tomografii pojemnościowej oraz jej platforma testowa"* (The architecture of the standalone capacitance tomography system with its test platform), Senior Lecturer **T. Olszewski** (supervisor).

[MSc45] Maciej Jerzy Sułecki: *„Projekt i realizacja systemu do rejestracji ruchu w trakcie wykonywania badań funkcjonalnych w rezonansie magnetycznym"* (Design and implementation of movement recording system during functional tests in magnetic resonance imaging), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[MSc46] Katarzyna Szczygielska: *„Opracowanie nadajnika adaptacyjnego systemu łączności satelitarnej z wykorzystaniem techniki SDR"* (Development of adaptive transmitter for satellite communications system using SDR technology), Assist. Prof. **K. Kurek** (supervisor).

[MSc47] Aleksandra Szewc: *„Zastosowanie analizy fraktalnej w automatycznej klasyfikacji obrazów strukturalnych badań MRI"* (The use of the fractal analysis for automatic classification of structural Magnetic Resonance Images), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[MSc48] Marta Sztybor: *"Środowisko programowe do badań symulacyjnych ultraszerokopasmowych systemów lokalizacyjnych"* (Software development for simulation studies of ultrawideband localization systems), Assist. Prof. **J. Kołakowski** (supervisor).

[MSc49] Piotr Szupiluk: *"Inteligentny moduł klasyfikacji warstw geotechnicznych na podstawie badań in-situ"* (Intelligent soil layers classification module based on in-situ examinations), Assoc. Prof. **P. Bilski** (supervisor).

[MSc50] Jan Szyszko: *"Obrazowanie nanocząstek magnetycznych"* (Magnetic particle imaging), Assoc. Prof. **W. Smolik** (supervisor).

[MSc51] Łukasz Torbicki: *"Sieci społeczne w modelowaniu epidemii"* (Social networks in epidemiological modeling), Assist. Prof. **B. Konarzewski** (supervisor).

[MSc52] Mateusz Walczyk: *"Opracowanie i badanie systemu miniAPRS dla misji balonowych"* (Development and testing of miniAPRS system for high altitude balloon missions), Prof. **Y. Yashchyshyn** (supervisor).

[MSc53] Mikołaj Piotr Wiewióra: *„Badanie interakcji człowieka z otwieranymi drzwiami"* (Research on the interaction between human's arm and a door), Assist. Prof. **T. Winiarski** (supervisor).

[MSc54] Łukasz Wiktorowicz: *"Wirtualna płyta czołowa do tomografu pojemnościowego"* (Virtual front-end board for an electrical

capacitance tomograph), Senior Lecturer **T. Olszewski** (supervisor).

[MSc55] Robert Wiktorowicz: *"System medyczny do archiwizacji i wyszukiwania obrazów podobnych na przykładzie diagnostyki raka płuc"* (Implementation of a medical information system for archiving, processing and content based retrieval for lung CT images), Prof. **A. Przelaskowski** (supervisor).

[MSc56] Krzysztof Wolański: *"Sposoby wzmacniania ruchu w obrazie wideo"* (Motion magnification in movies), Assist. Prof. **J. Naruniec** (supervisor).

[MSc57] Katarzyna Wojtasik: *"Modelowanie propagacji radiowej w środowisku miejskim w pasmie UHF dla potrzeb systemów łączności głosowej"* (Modelling of the radio wave propagation in the urban environment and the UHF band for the needs of voice comunications systems), Assist. Prof. **K. Kurek** (supervisor).

[MSc58] Anna Wróblewska: *"Kalibracja komór transmisyjnych do pomiaru DAP w aparatach rentgenowskich"* (Calibration of the transmission chamber to measure the DAP rate), Assist. Prof. **P. Tulik** (supervisor).

[MSc59] Joanna Zamojska: *"Optymalizacja mobilnej przeglądarki obrazów medycznych na użytek telediagnostyki"* (Optimization of mobile browser of medical images for the purposes of telediagnosis), Prof. **A. Przelaskowski** (supervisor).

[MSc60] Rafał Zawiślak: *„Projekt i realizacja inteligentnej, przełączanej anteny odbiorczej zmieniającej polaryzację zgodnie z polaryzacją odbieranej fali"* (Project and realization of the intelligent antenna switching the polarization according to the received wave polarization), Assist. Prof. **M. Bury** (supervisor).

[MSc61] Dominika Życka: *"Metody przetwarzania obrazów TK w diagnostyce wczesnych udarów mózgu"* (CT image processing methods in hyperacute stroke diagnosis), Prof. **A. Przelaskowski** (supervisor).

[MSc62] Marek Żyliński: *„Wielokanałowy holterowski rejestrator polifizjologiczny"* (Multichannel polyphysiographic holter recorder), Assist. Prof. **P. Tulik** (supervisor).

5.4. M.Sc. Evening Studies on Radiocommunications – M.Sc. Degrees

[MSc63] Adrian Markowski: *"System transmisji danych w środowisku specjalnym portu lotniczego"* (Data transfer system in the special enviroment of the airport), Assist. Prof. **T. Kosiło** (supervisor).

[MSc64] Tomasz Zysser: *„Optymalizacja filtru wyjściowego i wzmacniacza mocy do nadajników radiofonicznych z modulacją FM w zakresie częstotliwości 87,5 – 108 MHz"* (Optimization of the output filter and the power amplifier for transmitters with FM modulation in the frequency range 87.5 – 108 MHz), Assist. Prof. **J. Modzelewski** (supervisor).

5.5. B.Sc. Degrees

[BSc1] Stanisław Aleksiński: *"Projekt i realizacja miksera estradowego sterowanego bezprzewodowo"* (Project and realization of mixing console controlled remotely), Senior Lecturer **P. Bobiński** (supervisor).

[BSc2] Michał Antosiewicz: *"Weryfikacja nowej metody obliczania mocy traconej w elementach aktywnych we wzmacniaczu klasy AB"* (Verification of a new method of calculating the power dissipated in the transistor in the class-AB amplifier), Assist. Prof. **J. Modzelewski** (supervisor).

[BSc3] Kamil Tomasz Bińkowski: *„Implementacja sprzętowa układu kompensacji ruchu dekodera H.265/HEVC"* (Hardware implementation of motion compensation module in decoder H.265/HEVC), Assist. Prof. **G. Pastuszak** (supervisor), B.Sc. degree with honours.

[BSc4] Marta Aleksandra Bryła: *"Modelowanie właściwości elektromagnetycznych past grafenowych"* (Electromagnetic modelling of graphene inks), Assist. Prof. **B. Salski** (supervisor).

[BSc5] Michał Ciechański: *"Monitor ruchu palców do czynnościowego rezonansu magnetycznego"* (Finger movements monitor in fMRI device), Assist. Prof. **B. Sawionek** (supervisor).

[BSc6] Radosław Czerski: *„Sterowanie kursorem komputerowym za pomocą ruchów głowy"* (Controlling computer cursor with head moves), Assist. Prof. **G. Galiński** (supervisor).

[BSc7] Michał Daniluk: *„System szacowania wartości pulsu poprzez analizę sekwencji wideo"* (Evaluation of the pulse through video sequence analysis), Assist. Prof. **J. Naruniec** (supervisor).

[BSc8] Piotr Daraszkiewicz: *"Wirtualne przyrządy pomiarowe w technologii Java"* (Virtual instruments in Java technology), Prof. **W. Winiecki** (supervisor).

[BSc9] Łukasz Dąbek: *„Detektor promieniowania elektromagnetycznego na pasmo od 0,5 GHz do 5 GHz"* (The detector of electromagnetic radiation in 0.5 GHz to 5 GHz bandwidth), Assist. Prof. **D. Gryglewski** (supervisor)

[BSc10] Aneta Dąbrowska: *„Urządzenie do turbidymetrii"* (Turbidimetry device), Assist. Prof. **G. Domański** (supervisor).

[BSc11] Bartłomiej Dembiński: *"Tranzystorowy wzmacniacz gitarowy wraz z kolumną głośnikową"* (Solid state guitar amplifier with guitar cabinet), Senior Lecturer **P. Bobiński** (supervisor).

[BSc12] Wojciech Dołęga: *„Projekt łącza bezprzewodowego pracującego w paśmie 2,4 GHz z rozpraszaniem bezpośrednim widma"* (Wireless link for 2.4 GHz band with direct sequence spread spectrum), Senior Lecturer **H. Chaciński** (supervisor).

[BSc13] Krzysztof Dowalla: *„Czujnik inteligentny z interfejsem Z-Wave"* (Smart sensor with Z-Wave interface), Assist. Prof. **R. Łukaszewski** (supervisor).

[BSc14] Magdalena Dusza: *"Wirtualny przyrząd pomiarowy na platformę Android"* (Virtual measuring instrument on the Android Platform), Assist. Prof. **R. Łukaszewski** (supervisor).

[BSc15] Wojciech Endzelm: *"Model tomografu impedacyjnego z jednym układem pomiarowym"* (The impedance tomograph model with a single measuring track), Senior Lecturer **T. Olszewski** (supervisor).

[BSc16] Marta Filipowicz: *"Prezentacja treści dodatkowych na podstawie rozpoznawanych wzorców na platformie mobilnej"* (Presentation of additional content on the basis of recognized patterns on the mobile platform), Assist. Prof. **G. Galiński** (supervisor).

[BSc17] Damian Gadomski: *"Projekt i realizacja detektora ruchu"* (Design and construction of a motion detector), Assist. Prof. **S. Kozłowski** (supervisor).

[BSc18] Sylwia Gajownik: *"Wyznaczenie grubości istoty szarej na podstawie atlasów mózgu"* (Measuring the cortical thickness based on the cerebral atlases), Prof. **P. Bogorodzki** (supervisor).

[BSc19] Dariusz Gauza: *"Oprogramowanie do klasteryzacji danych pochodzących z mikromacierzy DNA"* (Software for clustering microarray data), Assist. Prof. **T. Rubel** (supervisor).

[BSc20] Anna Głowala: *"Miernik impedancji skóry zwierzęcia laboratoryjnego"* (The device for bioimpedance measurement for laboratory animals), Prof. **A. Grzanka** (supervisor).

[BSc21] Alicja Jachimczyk: *"Komputerowe rozpoznawanie obiektów dermatologicznych"* (Computerized recognition of skin lesions), Assist. Prof. **Z. Wawrzyniak** (supervisor).

[BSc22] Marta Anna Jaczyńska: *„Darmowy serwer DICOM współpracujący ze skanerem Picker Pro-View”* (Darmowy serwer DICOM współpracujący ze skanerem Picker Pro-View), Assist. Prof. **B. Sawionek** (supervisor).

[BSc23] Wojciech Michał Jankowski: *„Układ zdalnego załączania odbiornika energii elektrycznej z interfejsem ZigBee”* (Remote switch of electric devices with ZigBee interface), Assist. Prof. **R. Łukaszewski** (supervisor).

[BSc24] Miłosz Jarzynka: *“Realizacja i badanie modulowanego czasowo szyku antenowego na pasmo 5 GHz”* (Development and measurements of 5 GHz band time modulated antenna array), Prof. **Y. Yashchyshyn** (supervisor).

[BSc25] Maciej Jasiński: *“Poziomy dźwięku występujące w orkiestrach dętej i symfonicznej”* (Sound levels in wind and symphony orchestras), Prof. **J. Żera** (supervisor).

[BSc26] Krzysztof Kamil Jastrzębski: *„Układ mikroprocesorowy obsługujący polowy detektor neutronów termicznych”* (A microprocessor readout system for field thermal neutron detector), Prof. **J. Marzec** (supervisor).

[BSc27] Adam Kazimierz Jaworski: *„Mini GAMMAKAMERA („hand-held gamma camera”) dla wspomagania operacji onkologicznych”* (Hand-held mini gamma camera, supporting oncological surgeries), Assist. Prof. **R. Szabatin** supervisor).

[BSc28] Michał Jurkiewicz: *„Implementacja sprzętowa modułów transformacji kodeka H.265 /HEVC”* (Hardware implementation of transformation modules for the H.265 /HEVC codec), Assist. Prof. **G. Pastuszak** (supervisor), B.Sc. degree with honours.

[BSc29] Dawid Kalota: *„Badanie aktywności ludzkiej (oddech i bicie serca) za pomocą fal radiowych”* (Measurement of human activity (breath and heartbeat) using radio waves), Prof. **K. Kulpa** (supervisor).

[BSc30] Sylwia Ewa Kamińska: *„Domowy miernik ciśnienia tętniczego”* (Home blood pressure measurer), Assist. Prof. **R. Kurjata** (supervisor).

[BSc31] Kacper Kopka: *“Mobilna aplikacja do sterowania pompą insulinową”* (Mobile application to control the insulin pump), Senior Lecturer **A. Łuczyk** (supervisor).

[BSc32] Monika Korczak: *„Metody Monte Carlo w modelowaniu terapeutycznych wiązek elektronowych z medycznych akceleratorów śródoperacyjnych”* (Monte-Carlo methods in modelling therapeutic electron beams from medical intraoperative accelerators), Assist. Prof. **M. Dziewiecki** (supervisor).

[BSc33] Alicja Kosik: *“Badanie skuteczności działania kontrastów radiologicznych w ocenie porowatych biomateriałów hydrożelowych z zastosowaniem mikrotomografii komputerowej”* (Testing of radiological contrasts in evaluation of porous hydrogels biomaterials using X-ray microtomography), Prof. **W. Święszkowski** (supervisor).

[BSc34] Tymoteusz Kosiński: *“Wykonanie i uruchomienie detektora do pomiaru energii wiązki elektronów z akceleratora”* (Construction and preliminary tests of a device for measurement of the energy of accelerator-generated electron beam), Prof. **K. Zaremba** (supervisor).

[BSc35] Michał Kosyl: *“Biblioteka programowych narzędzi kodowania wideo HEVC”* (Software library of coding tools for H.265/HEVC video compression standard), Assist. Prof. **G. Galiński** (supervisor), B.Sc. degree with honours.

[BSc36] Krzysztof Krysiak: *„Projekt soczewki dielektrycznej do pomiarów paneli pochłaniających w pasmie X”* (Design of a delectric lens X-band measurements of absorbers), Assist. Prof. **B. Salski** (supervisor).

[BSc37] Karolina Maria Kucharska: *„Projekt interaktywnej mapy kampusu Politechniki Warszawskiej z wykorzystaniem rzeczywistości rozszerzonej na platformie mobilnej”* (Interactive map of the Warsaw University of Technology campus as augmented reality application on mobile platform), Assoc. Prof. **P. Bilski** (supervisor).

[BSc38] Piotr Kusiak: *“System automatycznego, optycznego odczytu dokumentu tożsamości”* (The integrated system of optical recognition of identity card), Assist. Prof. **J. Naruniec** (supervisor).

[BSc39] Marta Kuzak: *“Edytor plików multimedialnych MP4”* (MP4 multimedia file editor), Assist. Prof. **A. Buchowicz** (supervisor).

[BSc40] Hai Quang Le: *„Sterownik mikroprocesorowy do programowania układów PLL z szyną szeregową”* (Microprocessor controller for programming PLL systems with serial bus), Assist. Prof. **W. Kazubski** (supervisor).

[BSc41] Anna Lejk: *“Analiza sieci połączeń w mózgu na podstawie badania fMR”* (Brain connectivity analysis of fMRI data), Prof. **P. Bogorodzki** (supervisor).

[BSc42] Emilia Leliwa-Kopystyńska: *„Ocena oddziaływania hałasu lotniczego na rejony przylotniskowe, na podstawie pomiarów własnych, w wybranych punktach w otoczeniu Portu Lotniczego im. F. Chopina w Warszawie”* (The assesment of aircraft noise measurements at chosen points around of F. Chopin Warsaw airport), Assist. Prof. **E. Kotarbińska** (supervisor),

graduated from the Faculty of Environmental Engineering, WUT.

[BSc43] Agata Lewicka: *"Interactive Warsaw University of Technology campus map using the augmented reality on a mobile platform"* (Projekt interaktywnej mapy kampusu Politechniki Warszawskiej z wykorzystaniem rzeczywistości rozszerzonej na platformie mobilnej), Assoc. Prof. **P. Bilski** (supervisor), studies in English.

[BSc44] Piotr Lewicki: *„Uniwersalny dwukanałowy blok akwizycji do odbiornika klasy SDR"* (Data acquisition system for SDR receiver), Assist. Prof. **D. Rosołowski** (supervisor).

[BSc45] Paulina Łagowska: *"Wpływ średnicy na szybkość i sposób degradacji rusztowań tkankowych wytworzonych z polimerów bioresorbowalnych"* (Effects of filaments diameters on in vitro degradation of bioresorbable scaffolds for tissue engineering), Prof. **W. Święszkowski** (supervisor).

[BSc46] Marta Jolanta Łępicka: *„Implementacja i porównanie metod łączenia chmur punktów"* (Implementation and evaluation of methods of point cloud alignment), Assist. Prof. **T. Kornuta** (supervisor), B.Sc. degree in honours.

[BSc47] Piotr Machel: *"Układ pomiarowy do oceny parametrów hałasu w środowisku pracy"* (Electronic circuit for evaluating noise parameters in work environment), Assist. Prof. **M. Tajchert** (supervisor).

[BSc48] Milena Maćkowska: *"Odtwarzacz multimedialny dla standardu MPEG-DASH"* (MPEG-DASH multimedia player), Assist. Prof. **A. Buchowicz** (supervisor).

[BSc49] Michał Mańkowski: *"Uogólnianie reguł decyzyjnych metodą uzupełniania funkcji boolowskich"* (Decision rule generalization using complement of boolen function), Prof. **T. Łuba** (supervisor).

[BSc50] Aleksandra Markowska: *"Badanie wpływu przygotowania powierzchni na własności fizyczne płytek (CD, MN) Te"* (Study on the influence of surface preparation on physical properties of (Cd, Mn) Te platelets), Assist. Prof. **R. Szabatin** (supervisor).

[BSc51] Krzysztof Mądry: *"System do pomiaru parametrów energetycznych"* (System for measurement of the energy performances), Assist. Prof. **R. Łukaszewski** (supervisor).

[BSc52] Magdalena Michalska: *"Modele kompartymentów układu sercowo-naczyniowego"* (Compartmental models of cardiovascular system), Prof. **A. Grzanka** (supervisor).

[BSc53] Piotr Milewski: *"Project i realizacja wszechkierunkowego źródła dźwięku do zastosowań pomiarowych"* (Project and realization of omnidirectional sound source dedicated to use in acoustic measurements), Senior Lecturer **P. Bobiński** (supervisor).

[BSc54] Ernest Rafał Miller: *„Generator mocy w.cz. 480 kHz/30W"* (RF power generator 480 kHz/30W), Assist. Prof. **M. Mikołajewski** (supervisor).

[BSc55] Michał Miotke: *"Otwarty serwer DICOM współpracujący z konsolą skanera G-Scan firmy Esaote"* (Open DICOM server working with G-Scan's console produced by Esaote), Assist. Prof. **B. Sawionek** (supervisor).

[BSc56] Karolina Niemirka: *"Mikroprocesorowe urządzenie do pomiaru zmian imedancji tkanki"* (Microprocessor device for measuring changes of impedance the tissue), Assist. Prof. **G. Domański** (supervisor).

[BSc57] Konrad Nykel: *„Oprogramowanie do zdalnej obsługi mikroogniskowej lampy rentgenowskiej z wykorzystaniem interfejsu RS-232"* (Software for remote control of a microfocus RTG lamp using RS-232 interface), Prof. **J. Marzec** (supervisor).

[BSc58] Krzysztof Olejniczak: *"Urządzenie do generacji liczb losowych"* (Hardware random number generator), Assist. Prof. **G. Domański** (supervisor).

[BSc59] Miłosz Oleniecki: *„Implementacja syntezatora muzycznego w technologii VST"* (Implementation of the VST music synthesizer), Senior Lecturer **P. Bobiński** (supervisor).

[BSc60] Adrian Okarski: *„Rekonstrukcja kształtu obiektów 3D z wykorzystaniem metody fotometrycznej"* (3D shape reconstruction using photometric method), Assist. Prof. **P. Garbat** (supervisor), Warsaw University of Technology Distant Learning Center (Ośrodek Kształcenia na Odległość PW).

[BSc61] Krzysztof Oskroba: *„System monitorujący aktywność urządzenia elektrycznego z wykorzystaniem standardu Bluetooth Low Energy"* (Electrical device activity monitoring system using Bluetooth Low Energy standard), Prof. **W. Winiecki** (supervisor).

[BSc62] Klaudiusz Pastuszka: *„Projekt systemu informatycznego wspomagającego funkcjonowanie przedsiębiorstwa produkcyjnego - moduł logistyczny"* (Project system to support the functioning of the production company - logistics module), Senior Lecturer **K. Madziar** (supervisor), Warsaw University of Technology, Distant Learning Center (Ośrodek Kształcenia na Odległość PW).

[BSc63] Tomasz Penczek: *"Implementacja modelu Okumury - Haty w programie do modelowania propagacji fal ultrakrótkich"* (Implementation of Okumura - Hata model in a computer program modelling very high frequency radio waves), Assist. Prof. **W. Kazubski** (supervisor).

[BSc64] Kamil Popiołek: *"System rozpoznawania znaków towarowych"* (Trademark recognition system), Assist. Prof. **G. Galiński** (supervisor).

[BSc65] Rafał Protasiuk: *"Zastosowanie miary SSIM w ocenie jakości sekwencji wizyjnych"* (The use of SSIM measure in video quality assessment), Assist. Prof. **A. Buchowicz** (supervisor).

[BSc66] Alexander Repnikov: *"Projekt i realizacja dwudrożnej kolumny głośnikowej do systemu audio"* (Design and creation of a two-way loudspeaker for audio system), Senior Lecturer **P. Bobiński** (supervisor).

[BSc67] Wanda Aleksandra Rogowska: *„Sposoby modyfikacji powierzchni rusztowań tkankowych do regeneracji tkanki kostnej"* (Surface modifications of scaffold for bone tissue regeneration), Prof. **W. Święszkowski** (supervisor), B.Sc. degree with honours.

[BSc68] Marek Rudnik: *"Projekt systemu rekomendacji plików muzycznych"* (Project of music recommendation system), Assoc. Prof. **P. Bilski** (supervisor).

[BSc69] Martika Rutkowska: *"Mikroprocesorowy zegar pacjenta"* (Microprocessor - based patient watch), Assist. Prof. **R. Kurjata** (supervisor), B.Sc. degree with honours.

[BSc70] Tomasz Tadeusz Siczek: *„Sprzętowe interfejsy czasu rzeczywistego HDTV"* (Real-time hardware HDTV interfaces), Assist. Prof. **G. Pastuszak** (supervisor).

[BSc71] Mateusz Sieńczewski: *"Metoda analizy grupowej tensora obrazów dyfuzji"* (A group analysis method for Diffusion Tensor Imaging), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[BSc72] Anna Sikorska: *"Projekt i realizacja nagrań wokalnych przy wykorzystaniu odpowiednich technik studyjnych"* (Project and realization of vocal recordings with the use of appropriate studio techniques), Senior Lecturer **P. Bobiński** (supervisor).

[BSc73] Mateusz Słoboda: *"Planarna antena eliptyczna do zastosowań w systemach ultraszerokopasmowych"* (Planar elliptical antenna for ultra-wideband systems), Assist. Prof. **P. Bajurko** (supervisor).

[BSc74] Tomasz Służewski: *"Opracowanie oraz realizacja łącza optycznego na diodach LED"* (Design and implementation of a LED-based optical link), Prof. **Y. Yashchyshyn** (supervisor).

[BSc75] Mariusz Sosiński: *„Oprogramowanie do badania własności wybranych sygnałów losowych w środowisku LabView"* (Computer software for the study of the selected random signals features in LabView programming environment), Assist. Prof. **K. Radecki** (supervisor).

[BSc76] Patryk Spalik: *"System inteligentnego wspomagania procedur nagłych w medycynie"* (Smart system of supporting urgent procedures in medicine), Prof. **A. Przelaskowski** (supervisor).

[BSc77] Przemysław Jacek Stachura: *„Materiały elastyczne na implanty dysku międzykręgowego"* (Elastometric materials for an intervertebral disc prosthesis), Prof. **J. Ryszkowska** (supervisor from Faculty of Mechatronics).

[BSc78] Piotr Staniszewski: *„Oprogramowanie do akwizycji wyników pomiarowych w Laboratorium Radiokomunikacji"* (Screen capturing program for Radiocommunication Laboratory), Reader **J. Cichocki** (supervisor).

[BSc79] Teodor Stefanow: *"Stanowisko do badania transmisji danych za pośrednictwem światła widzialnego (LED)"* (Data transmission via visible LED light), Assist. Prof. **T. Buczkowski** (supervisor).

[BSc80] Marlena Teresa Struk: *„Algorytm poprawy jakości obrazów ultrasonograficznych uzyskanych metodą syntetyczną apertury"* (Algorithm for improving image quality in synthetic aperture ultrasound imaging), Assist. Prof. **M. Rupniewski** (supervisor).

[BSc81] Magdalena Ślusarczyk: *"Kodek z adaptacyjną predykcją obrazu"* (Codec with image adaptation prediction), Prof. **A. Przelaskowski** (supervisor).

[BSc82] Grzegorz Szafrański: *"Projekt oraz badanie anteny ESPAR"* (Design and research of an ESPAR antenna), Prof. **Y. Yashchyshyn** (supervisor).

[BSc83] Adrian Szymczykiewicz: *"Program do demonstracji formantów samogłosek mowy"* (Program demonstrating formants of vowels), Prof. **J. Żera** (supervisor).

[BSc84] Jan Bolesław Szyszko: *„Obrazowanie nanocząsteczek magnetycznych"* (Magnetic particle imaging), Assoc. Prof. **W. Smolik** (supervisor).

[BSc85] Radosław Tandecki: *"Implementacja sprzętowa układu kompensacji ruchu w koderze H.265/HEVC"* (Harware implementation of the motion compensation system in the H.265/HEVC), Assist. Prof. **G. Pastuszak** (supervisor), B.Sc. degree with honours.

[BSc86] Przemysław Teodorski: *"System zarządzania równoległym wykonywaniem procesów obliczeniowych"* (Management system for processes being run in parallel), Assist. Prof. **B. Sawionek** (supervisor).

[BSc87] Jiang Tianlin: *"Estymacja parametrów kanałów telekomunikacyjnych w optycznym systemie WDM przy użyciu procedur optymalizacyjnych"* (Estimation of parameters of telecommunication channels in WDM optical system using optimisation

procedures), Assist. Prof. **A. Miękina** (supervisor), studies in English.

[BSc88] Jakub Maciej Wilkowski: *„Projekt i realizacja anteny mikropaskowej na pasmo 60 GHz zasilanej linią koplanarną”* (Design and production of a microstrip antenna for 60 GHz fed with a coplanar waveguide), Prof. **Y. Yashchyshyn** (supervisor).

[BSc89] Michał Wlaź: *“Program kalkulatora FDTD w systemie Android z wykorzystaniem biblioteki Qt”* (An implementation of a FDTD calculator application for Android operating system using Qt library), Assist. Prof. **M. Sypniewski** (supervisor).

[BSc90] Joanna Wiśniewska: *“Odtwarzacz sekwencji wielowidokowych”* (Multiview player), Assist. Prof. **G. Galiński** (supervisor), B.Sc. degree with honours.

[BSc91] Szymon Wójtowicz: *“Odbiornik sygnału DCF”* (DCF signal receiver), Senior Lecturer **H. Chaciński** (supervisor).

[BSc92] Anna Wyszyńska: *“Klasyfikacja schorzeń nowotworowych na podstawie danych aktywności genów przy użyciu sztucznych sieci neuronowych”* (Classification of cancer diseases on the basis of data on the activity of genes by using artificial neural networks), Assist. Prof. **T. Rubel** (supervisor).

[BSc93] Katarzyna Zadurska: *“Wytwarzanie i charakteryzacja nanowłókien polilaktydu z dodatkiem nanocząsteczek Al2O3 oraz Al2O3/Ag do zastosowań w inżynierii tkankowej”* (Preparation and characterization of polylactide nanofibers containing Al2O3 and Al2O3/Ag nanoparticles for tissue engineering), Prof. **A. Olszyna** (supervisor).

[BSc94] Natalia Maria Zienkowicz: *„Kwaternionowa postać wykładnicza w analizie zmian poziomu jasności i rekonstrukcji obrazów kolorowych”* (Quaternion polar representation in analysis of luminosity of color images), Assist. Prof. **K. Snopek** (supervisor).

[BSc95] Adrianna Zychewicz: *„Zarządzenie efektywnym zużyciem energii w środowisku domowym (home area network)”* (Efficient management of energy consumption in home area network), Assoc. Prof. **K. Snopek** (supervisor).

[BSc96] Marek Żelechowski: *„Projekt i wykonanie modelu funkcjonalnego urządzenia Motion Capture w oparciu o technologię MEMS”* (Design and implementation of Motion Capture device based on the MEMS technology, Assist. Prof. **B. Konarzewski** (supervisor).

[BSc97] Ewelina Żochowska: *„Program do obrazowania multimodalnego”* (A multimodal imaging program), Assist. Prof. **P. Brzeski** (supervisor).

[BSc98] Anna Małgorzata Żukowska: *„Analiza struktury mózgu na przykładzie danych MR”* (Analysis of brain structures using MR data), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

5.6 B.Sc. Evening Studies on Radiocommunications – B.Sc. Degrees

[BSc99] Kamil Dudek: *“Diagnostyka magistrali USB”* (USB diagnostics), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[BSc100] Paweł Matuszczak: *“Przenośny miernik promieniowania z wykorzystaniem detektora wielopikselowego”* (Portable radiation meter using multi-pixel detector), Assist. Prof. **R. Kurjata** (supervisor).

[BSc101] Łukasz Maciocha: *“Sterownik mikroprocesorowy do sterowania pętli PLL”* (Phased loop controlling device based on microcontroller), Assist. Prof. **W. Kazubski** (supervisor).

[BSc102] Piotr Szybiński: *„Projekt i realizacja dwurożnej kolumny głośnikowej do systemu audio”* (Design and creation of a two-way loudspeaker for audio system), Senior Lecturer **P. Bobiński** (supervisor).

6. PUBLICATIONS

6.1. Scientific and technical books, chapters in books

[Pub1] P. Bogorodzki, E. Piątkowska-Janko, B. Pruszyński: „Tomografia rezonansu magnetycznego" (Resonance Magnetic Tomography), in: B. Pruszyński, A. Cieszanowski (Eds.), *Radiologia. Diagnostyka obrazowa Rtg, TK, USG, MR* (Radiology. Imaging X-- ray, CT, Ultrasound, MR), issue 2, chapter 2.2, ISBN: 978-83-200-477-21 (2014), pp. 15-34.

[Pub2] K. Liszewski, R. Łukaszewski, R. Kowalik, Ł. Nogal, W. Winiecki: „Different Appliance Identification Methods in Non-Intrusive Appliance Load Monitoring", in: V. Haasz, K. Madani (Eds.), *Advanced Data Acquisition and Intelligent Data Processing*, *River Publishers*, ISBN 978-87-9310-273-6 (2014), pp. 31-59.

[Pub3] T. Morawski, W. Gwarek: „Pola i fale elektromagnetyczne" (Fields and Electromagnetic Waves), *WNT*, issue 5, ISBN 978-83-7926-160-4, (2014), 303 pp.

[Pub4] D. Radomski: "A Multivariate Sample Entropy of Differentiated Electrohysterographical Signals for an Identification of an Uterine Labor Activities", in: E. Piętka, J. Kawa, W. Więcławek (Eds.), *Information Technologies in Biomedicine*, vol. 4, *Advances in Intelligent Systems and Computing*, vol. 284, *Springer-Verlag*, ISBN 978-33-1906-595-3, (2014), doi: 10.1007/978-3-319-06596-0_28, pp. 303-310.

[Pub5] T. Rubel, L. Raczyński, K. Zaremba: „Metody analizy danych w badaniach proteomicznych wykorzystujących spektrometrię mas" (Methods of Data Analysis in Proteomics Studies using Mass Spectrometry), in: W. Torbicz (Ed.), *Inżynieria Biomedyczna Podstawy i Zastosowania,* vol. 10 *Bioinformatyka* (P. Pawłowski, A. Polański, A. Świerniak, P. Zielenkiewicz Eds.), chapter 14, *Akademicka Oficyna Wydawnicza EXIT*, ISBN 978-83-7837-039-0, 436 pp.

[Pub6] W. Winiecki: "Systemy inteligentnego pomiaru energii elektrycznej" (Systems of Smart Measurement of Electrical Energy), in: A. Michalski (Ed.), *Wybrane Aspekty Mobilnych Systemów Pomiarowych*, *Wyd. Wojskowej Akademii Technicznej*, ISBN 978--83-7938-020-6, chapter 4, (2014), pp. 91--122.

[Pub7] Y. Yashchyshyn: „Teoria anten na podłożach dielektrycznych" (The Theory of Antennas on Dielectric Substrates), *Oficyna Wydawnicza PW* (2014), ISBN 978-83-7814-335-2, 215 pp.

[Pub8] B. Zieliński, M. Iwanowski, B. Salski, S. Reszkiewicz: „Detection of Defects in Carbon-Fiber Composites using Computer-Vision--Based Processing of Microwave Maps", in: R. S. Choraś (Ed.), *Image Processing & Communications*, *Challenges 6*, *Advances in Intelligent Systems and Computing*, *Springer*, ISBN 978-3-319-10661-8, vol. 313, pp. 245-252.

6.2. Scientific and technical papers in journals

6.2.1 Part A

This subsection contains the list of papers published in the journals indicated on the list A of the Ministry of Science and Higher Education, including those listed in the Thomson-Reuters Journal Citation Reports.
Papers authored by more than 10 persons from outside of the Faculty of Electronics and Information Technologies, WUT, have been specifed in a simplified way, *viz*.: only the first author and all the authors from the Faculty have been listed and the number of others authors has been provided in brackets.

[Pub9] K. Abe (…), M. Dziewiecki, R. Kurjata, J. Marzec, P. Płoński, K. Zaremba, M. Ziembicki (433 external authors): „Observation of Electron Neutrino Appearance in a Muon Neutrino Beam", *Physical Review Letters* (2014), vol. 112, pp. 061802-1-0618028-7.

[Pub10] K. Abe (…), M. Dziewiecki, R. Kurjata, J. Marzec, P. Płoński, K. Zaremba, M. Ziembicki (342 external authors): „Measurement of the Intrinsic Electron Neutrino Component in the T2K Neutrino Beam with the ND280 Detector", *Physical Review D* (2014), vol. 89, pp. 092003-1--092003-18.

[Pub11] K. Abe (…), M. Dziewiecki, R. Kurjata, J. Marzec, P. Płoński, K. Zaremba, M. Ziembicki (340 external authors): „Precise Measurement of the Neutrino Mixing Parameter θ_{23} from Muon Neutrino Disappearance in an Off-Axis Beam", *Physical Review Letters* (2014), vol. 112, issue 18, pp. 181801-1-181801-8.

[Pub12] K. Abe (…), M. Dziewiecki, R. Kurjata, J. Marzec, P. Płoński, K. Zaremba, M. Ziembicki (357 external authors): „Recent Results from the T2K Experiment", *Nuclear Physics B - Proceedings Supplements 246-247* (2014), pp. 23-28.

[Pub13] K. Abe (…), M. Dziewiecki, R. Kurjata, J. Marzec, P. Płoński, K. Zaremba, M. Ziembicki (396 external authors): „Measurement of the Inclusive ν_μ Charged Current Section on Iron and Hydrocarbon in the T2K on-axis Neutrino Beam", *Physical Review D*, vol. 90 (2014), pp. 052010-1-052010-17.

[Pub14] K. Abe (…), M. Dziewiecki, R. Kurjata, J. Marzec, P. Płoński, K. Zaremba, M. Ziembicki (320 external authors): „Measurement of the Inclusive Electron Neutrino Charged Current Cross Section on Carbon with the T2K Near Detector", *Physical Review Letters* (2014), vol. 113, pp. 241803-1-241803-7.

[Pub15] K. Abe (…), M. Dziewiecki, R. Kurjata, J. Marzec, P. Płoński, K. Zaremba, M. Ziembicki (360 external authors): „Measurement of the Neutrino-Oxygen Neutral-Current Interaction Cross Section by Observing Nuclear Deexcitation γ Rays", *Physical Review D*, vol. 90 (2014), pp. 072012-1-072012-11.

[Pub16] C. Adolph (…), M. Dziewiecki, R. Kurjata, J. Marzec, K. Zaremba, M. Ziembicki (226 external authors): "Transvere Target Spin Asymmetries in Exclusive$^{\rho 0}$ Muoproduction", *Physics Letters B* (2014), vol. 731, no. 4, pp. 19-26.

[Pub17] C. Adolph (…), M. Dziewiecki, R. Kurjata, J. Marzec, A. Rychter, K. Zaremba, M. Ziembicki (209 external authors): „Measurement of Radiative Widths of a_2 (1320) and π_2 (1670)", *The European Physical Journal A* vol. 50, no. 79 (2014), doi: 10.1140/epja/i2014-14079-8, pp. 1-19.

[Pub18] C. Adolph (…), M. Dziewiecki, R. Kurjata, J. Marzec, A. Rychter, K. Zaremba, M. Ziembicki (221 external authors): „Spin Alignment and Violation of the OZI Rule in Exclusive ϖ and φ Production in *pp* Collisions", *Nuclear Physics B*, vol. 886 (2014), pp. 1078-1101.

[Pub19] C. Adolph (…), M. Dziewiecki, R. Kurjata, J. Marzec, A. Rychter, K. Zaremba, M. Ziembicki (221 external authors): „A High-Statistics Measurement of Transvere Spin Effects in Dihadron production from Muon-Proton Semi-Inclusive Deep-Inelastic Scattering", *Physics Letters B*, vol. 736 (2014), pp. 124-131.

[Pub20] C. Adolph (…), M. Dziewiecki, R. Kurjata, J. Marzec, A. Rychter, K. Zaremba, M. Ziembicki (221 external authors): „Measurement of Azimuthal Hadron Asymmetries in Semi-Inclusive Deep Inelastic Scattering off Unpolarised Nucleons", *Nuclear Physics B 886* (2014), pp. 1046--1077.

[Pub21] M. Antonello (…), P. Płoński, K. Zaremba (57 external authors): "The Trigger System of the ICARUS Experiment for the CNGS Beam", *Journal of Instrumentation* (2014), doi: 10.1088/1748-0221/9/08/P08003, pp. 1-28.

[Pub22] M. Antonello (…), P. Płoński, K. Zaremba (55 external authors): "Experimental Observation of an Extremely High Electron Lifetime with the ICARUS-T600 Lar-TPC", *Journal of Instrumentation*, vol. 9 (2014), pp. P1200-1-P12006-13.

[Pub23] M. Bakun, G. Senatorski, T. Rubel, A. Łukasik, P. Zielenkiewicz, M. Dadlez, L. Pączek: „Urine Proteomes of Healthy Aging Humans Reveal Extracellular Matrix (ECM) Alterations and Immune System Dysfunction", *AGE*, vol. 36 (2014), doi: 10.1007/s11357-013-9562-7, pp. 299-311.

[Pub24] P. Bilski: "Data Set Preprocessing Methods for the Artificial Intelligence-based Diagnostic Module", *Measurement*, vol. 54 (2014), pp. 180-190.

[Pub25] P. Bilski: "Application of Support Vector Machines to the Induction Motor Parameters Identification", *Measurement* (2014), vol. 51, pp. 377-386.

[Pub26] P. Bilski, J. Wojciechowski: „Artificial Intelligence Methods in Diagnostics of Analog Systems", *International Journal of Applied Mathematics and Computer Science*, vol. 24, no. 2 (2014), doi: 10.2478/amcs--2014-0020, pp. 271-282.

[Pub27] P. Bogorodzki, E. Piątkowska-Janko, J. Szaflik, J. P. Szaflik, M. Gacek, P. Grieb: „Mapping Cortical Thickness of the Patients with Unilateral End-Stage Open Angle Glaucoma on Planar Cerebral Cortex Maps", *PloS One* (2014), vol. 9, issue. 4, article number.: e93682, doi: 10.1371 journal. pone.0093682, pp. 1-7.

[Pub28] S. Cygan, K. Werys, Ł. Błaszczyk, T. Kubik, K. Kałużyński: „Left Ventricle Phantom and Experimental Setup for MRI and Echocardiography – Preliminary Results of Data Acquisitions", *Biocybernetics and Biomedical Engineering* (2014), vol. 34, pp. 19-24.

[Pub29] L. Gawrys, M. Falkiewicz, A. Pilaciński, M. Riegel, E. Piątkowska-Janko, P. Bogorodzki, T. Wolak, R. Andrysiak, L. Królicki, R. Kuliński, D. Koziorowski, P. Janik, K. Rymarczyk, A. Grabowska, L. Kaczmarek, I. Szatkowska: „The Neural Correlates of Specific Executive Dysfunctions in Parkinson's Disease", *Acta Neurobiologiae Experimentalis* (2014), vol. 74, pp. 465-478.

[Pub30] W. Gwarek: "Understanding Propagation and Negative Refraction in Metamaterials through Time-Domain Simulation", *IEEE Microwave Magazine*, vol. 15, no. 4, (2014), pp. 56-65.

[Pub31] S. L. Hahn, K. M. Snopek: „Quasi-analytic Multidimensional Signals", *Bulletin of the Polish Academy of Sciences: Technical Sciences* (2014), vol. 61, issue 4, doi: 10. 2478/bpasts-2013-0109, pp. 1017-1024.

[Pub32] T. Karpisz, B. Salski, A. Szumska, M. Klimczak, R. Buczyński: "FDTD Analysis of Modal Dispersive Properties of Nonlinear Photonic Crystal Fibers", *Optical and Quantum Electronics* (2014), doi: 10.1007/s11082-014-9987-y, published online, 8 pp.

[Pub33] P. Kopyt, P. Zagrajek, J. Marczewski, K. Kucharski, B. Salski, J. Lusakowski, W. Knap, W. K. Gwarek: „Analysis of Sub-THz Radiation Detector Bulit of Planar Antenna Integrated with MOSFET", *Microelectronics Journal* (2014), vol. 45, pp. 1168-1176.

[Pub34] R. Korycki: "Detection of Montage in Lossy Compressed Digital Audio Recordings", *Archives of Acoustics* (2014), vol. 39,

no. 1, doi: 10.2478/aoa-2014-0007, pp. 65--72.

[Pub35] J. Kryszyn, W. Smolik, B. Radzik, T. Olszewski, R. Szabatin: “Switchless Charge-Discharge Circuit for Electrical Capacitance Tomography”, *Measurement Science and Technology* vol. 25, no. 11, 115009 (2014), doi: 10.1088/0957-0233/25/11/115009, 9 pp.

[Pub36] K. S. Kulpa, P. Samczyński, M. Malanowski, A. Gromek, D. Gromek, W. Gwarek, B. Salski, G. Tański: "An Advanced SAR Simulator of Three-Dimensional Structures Combining Geometrical Optics and Full-Wave Electromagnetic Methods", *IEEE Transactions on Geoscience and Remote Sensing (*2014), vol. 52, no. 1, pp. 776--784.

[Pub37] J. Naruniec: “Discrete Area Filters in Accurate Detection of Faces and Facial Features”, *Image and Vision Computing* (2014), vol. 32, pp. 979-993.

[Pub38] R. Milner, M. Rusiniak, M. Lewandowska, T. Wolak, M. Ganc, E. Piątkowska-Janko, P. Bogorodzki, H. Skarżyński: „Towards Neural Correlates of Auditory Stimulus Processing: A Simultaneous Auditory Evoked Potentials and Functional Magnetic Resonace Study using an Odd-ball Paradigm”, *Medical Science Monitor,* vol. 20 (2014), doi: 10.12659/MSM.89712, e-ISSN 1643-3750, pp. 35-46.

[Pub39] M. Nesteruk, E. Henning, M. Mikuła, J. Karczmarski, A. Dzwonek, K. Goryca, T. Rubel, A. Paziewska, M. Woszczyński, J. Ledwon, M. Dąbrowska, M. Dadlez, J. Ostrowski: „Mitochondrial-related Proteomic Changes during Obesity and Fasting in Mice are Greater in the Liver than Skeletal Muscles”, *Functional & Integrative Geonomics*, vol. 14 (2014), doi: 10.1007/s10142-013-0342-3, pp. 245-259.

[Pub40] J. P. Radomski, P. Płoński, W. Zagórski-Ostoja: „The Hemagglutinin Mutation E391K of Pandemic 2009 Influenza Revisited”, *Molecular Phylogenetics and Evolution*, vol. 70 (2014), pp. 29-36.

[Pub41] M. Roszkowski, G. Pastuszak: „Intra Prediction for the Hardware H.264/AVC High Profile Encoder”, *Journal of Signal Processing Systems* vol. 76, issue 1 (2014), doi: 10.1007/s11265-013-0820-9, pp. 11--17.

[Pub42] A. Rudziński: "Effective Number of Samples and Pseudo-random Nonlinear Distortions in Digital OFDM Coded Signal", *Circuits, Systems, and Signal Processing*, vol. 33, no. 1, (2014). doi: 10.1007/s00034--013-9622-3 pp.197-209.

[Pub43] A. Rudziński: "Compact Microstrip Loop Resonator Based Bandstop Filters for sub-GHz Channels", *Microwave and Optical Technology Letters*, vol. 56, no. 4, pp. 993--997 (2014), doi: 10.1002/mop.28202.

[Pub44] B. Salski: “Hybrid FDTD Analysis of Two- and Four-level Atomic Systems”, *Optical and Quantum Electronics*, doi: 10.1007/s11082-014 0027-8, pp. 1-4.

[Pub45] B. Salski: “An FDTD Model of Graphene Intraband Conductivity”, *IEEE Transactions on Microwave Theory and Techniques* (2014), vol. 62, no. 8, doi: 10.1109/TMTT.2014.2331620, pp. 1570-1578.

[Pub46] B. Salski: “An FDTD Model of a Thin Dispersive Layer”, *IEEE Transactions on Microwave Theory and Techniques* (2014), vol. 62, no. 9, pp. 1912-1919.

[Pub47] B. Salski, W. Gwarek, P. Korpas: "Electromagnetic Inspection of Carbon-Fiber-Reinforced Polymer Composites with Coupled Spiral Inductors", *IEEE Transactions on Microwave Theory and Techniques* (2014), vol. 62, no. 7, pp. 1535-1544.

[Pub48] B. Salski, W. Gwarek, P. Korpas, S. Reszewicz, A. Chong, P. Theodorakeas, I. Hatziioannidis, V. Kappatos, C. Selcuk, T-H. Gan, M. Koui, M. Iwanowski, B. Zieliński: „Non-Destructive Testing of Carbon--Fibre-Reinforced Polymer Materials with a Radio-Frequency Inductive Sensor”, *Composite Structures* (2014), doi: 10.1016/j.compstruct.2014.11.056.

[Pub49] B. Salski, J. Krupka, P. Kopyt: „Measurements of the Sheet Resistance of GaN Films on a Dielectric Substrate”, *The European Physical Journal Plus*, vol. 129, no. 184 (2014), doi: 10.1140/epjp/i2014--14184-1, published online, 9 pp.

[Pub50] M. Swat, B. Salski, T. Karpisz, G. Stępniewski, I. Kujawa, M. Klimczak, R. Buczyński: „Numerical Analysis of a Highly Birefringent Microstructured Optical Fiber with an Anisotropic Core”, *Optical and Quantum Electronics* (2014), doi: 10.1007/s11082-014-9984-1, published online, 12 pp.

[Pub51] J. Wagner, R. Z. Morawski, A. Miękina: „Comparison of Five SVD-Based Algorithms for Calibration of Spectophotometric Analyzers”, *Metrology and Measurement Systems* (2014), vol. XXI, no. 2, pp. 191--204.

[Pub52] A. Więckowski, P. Korpas, M. Krysicki, F. Dughiero, M. Bullo, F. Bressan, C. Fager: "Efficiency Optimization for Phase Controlled Multi-source Microwave Oven", *International Journal of Applied Electromagnetics and Mechanics* vol. 44, no. 2, (2014), doi: 10.3233/JAE-141764, pp. 235-241.

6.2.2. Part B

This subsection contains the list B of papers published in the journals indicated on the list B of the Ministry of Science and Higher Education.

[Pub53] A. Abramowski, G. Pastuszak: „Architektura sprzętowego modułu predykcji

wewnątrzramkowej Intra dla standardu H.265/HEVC" (An Intra Prediction Hardware Module Architecture for the H.265/HEVC Standard), *Elektronika-Konstrukcje-Technologie-Zastosowania*, no. 3 (2014), pp. 49-51.

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[Pub206] A. Rudziński: "Modelowanie statystyczne sygnału z modulacją OFDM" (Statistical Modeling of OFDM Modulated Signal), *Mat. Krajowej Konferencji Radiokomunikacji, Radiofonii i Telewizji: KKRRiT 2014* (Proc. National Conference on Radiocommunications and Broadcasting) (Warsaw, Poland, Jun. 11-13, 2014), 1 p.

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[Pub210] G. Szafrański, Y. Yashchyshyn: „Elektryczne kształtowanie charakterystyki promieniowania anteny za pomocą zmiany reaktancji obciążeń biernych promienników" (Electrical Shaping of Antenna Radiation by Changing the Reactance of Passive Radiators Load), *Mat. Krajowej Konferencji Radiokomunikacji, Radiofonii i Telewizji: KKRRiT 2014* (Proc. National Conference on Radiocommunications and Broadcasting) (Warsaw, Poland, Jun. 11-13, 2014), 1 p.

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7. RESEARCH REPORTS AND PATENTS

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[Rep2] S. L. Hahn: *„Derivations and calculations around the hypothesis explaining gravitation forces as recoil forces of radiation"* Internal report no. 1 of the Institute of Radioelectronics, WUT, Warsaw, Sept. 2014.

[Rep3] K. Ignasiak, W. Skarbek, A. Buchowicz, G. Galiński, J. Naruniec, G. Pastuszak, M. Jakubowski, M. Jędryka, M. Leszczyński, A. Nowakowski, A. Abramowski, G. Brzuchalski, M. Roszkowski, M. Wieczorek: *„Audiowizualne sieciowe systemy hybrydowe* (Audiovisual Network Hybrid Systems), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2014.

[Rep4] J. Kołakowski, J. Cichocki, R. Michnowski, K. Radecki, W. Kiełek, S. Żmudzin, A. Badawika: *"Przeprowadzenie badań algorytmów określania położenia w ultraszerokopasmowych systemach lokalizacyjnych"* (Investigation of Localization Algorithms Used in UWB Positioning Systems), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2014.

[Rep5] M. Lewandowski: *"Stanowisko laboratoryjne przeznaczone do badania właściwości czasowych cyfrowych modulatorów sigma-delta pobudzanych sygnałami mowy i muzyki oraz oceny słuchowej sygnałów wyjściowych badanych modulatorów"* (Laboratory Set for Testing Time Properties of Digital Sigma-Delta Modulators Stimulated by Speech and Music Signals and Evaluation of Auditory Output Signals), Final report for the Dean grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2014.

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[Rep7] J. Modelski, K. Kurek T. Keller, M. Dąbrowski, M. Darmetko, K. Derzakowski: *„Analiza architektur uniwersalnego odbiornika cyfrowej telewizji naziemnej standardu DVB-T2"* (Methods of Modification AES Encryption Algorithm in Data Transmission Systems for Satellite Applications), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2014.

[Rep8] J. Modzelewski, H. Chaciński, W. Kazubski, M. Mikołajewski: *"Doskonalenie układów, metod analizy i projektowania liniowych i kluczowanych wzmacniaczy mocy wielkiej częstotliwości"* (Improving the Topology and Methods of Analysis and Design of Linear and Switched H.F. Power Amplifiers), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2014.

[Rep9] R. Z. Morawski, A. Miękina, A. Podgórski: *"Interpretacja danych pomiarowych – metodyka i aspekty meta-metrologiczne* (Interpretation of Measurement Data – Methodology and Metametrological Aspects), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2014.

[Rep10] J. Naruniec: *"Współpraca z firmą Samsung Electronics Polska sp. z.o.o. w realizacji projektu: Face detection and frontalization"* (Cooperation with Samsung Electronics Poland Ltd. within the Framework of a Face Detection and Frontalization Project), Final report for Samsung Electronics Poland Ltd., Warsaw, Dec. 2014.

[Rep11] J. Naruniec: *"Analiza techniczna w formie prezentacji oraz wykładów przeznaczonych dla pracowników firmy Samsung Electronics Polska sp.z.o.o"* (The Technical Analysis, Presentations and Lectures, for Employees of Samsung Electronics Poland Ltd.), Final report for Samsung Electronics Poland Ltd., Warsaw, Dec. 2014.

[Rep12] K. M. Snopek, N. M. Zienkowicz: *„Quatemion polar representation in analysis of brightness of color images"*, Internal report no. 2 of the Institute of Radioelectronics, WUT, Jul. 2014.

[Rep13] W. Winiecki, P. Bilski, P. Czernik, R. Łukaszewski, K. Mroczek, J. Olszyna: *„Rozwój metod projektowania stacjonarnych i rozproszonych systemów pomiarowych"* (Advancement in the Design Methods of Stationary and Distributed Measurement Systems), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2014.

[Rep14] J. Wojciechowski, A. Bilski, S. Kozłowski, K. Snopek: *„Badania w zakresie sygnałów wielowymiarowych, metod diagnostyki i*

sieci" (Investigation on Multidimensional Signals, Diagnostics and Networks), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec 2014.

[Rep15] Y. Yashchyshyn P. Bajurko, K. Derzakowski, A. Łysiuk, K. Godziszewski, G. Bogdan, P. Piasecki: *"Określenie parametrów dynamicznych stanowiska do pomiarów w paśmie milimetrowym i subterahercowym"* (Determination of the Dynamic Parameters of Measurement Setup in Millimeter and Sub-Teraherz), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2014.

[Rep16] Y. Yashchyshyn, P. Bajurko, K. Godziszewski: "Projekt, realizacja i badanie anten na pasmo 5,2-5,9 GHz" (Design, Implementation and Investigation of Antennas at 5.2-5.9 GHz Band), Final report for CAMSAT, Gralak Przemysław, Institute of Radioelectronics, WUT, Warsaw, Mar. 2014.

[Rep17] K. Zaremba, P. Bogorodzki, P. Brzeski, G. Domański, T. Jamrógiewicz, B. Konarzewski, R. Kurjata, J. Marzec, T. Olszewski, E. Piątkowska-Janko, D. Radomski, B. Sawionek, W. Smolik, R. Szabatin, M. Ziembicki, S. Adaszewski, M. Dziewiecki, Ł. Kołaszewski, W. Obrębski: *„Nowoczesne techniki elektroniki jądrowej i medycznej"* (Modern Techniques in Nuclear and Medical Electronics), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2014.

[Rep18] J. Żera, Z. Kulka, P. Bobiński, E. Kotarbińska M. Tajchert M. Lewandowski: *„Projektowanie i badania systemów elektroakustycznych oraz systemów cyfrowego przetwarzania sygnałów fonicznych"* (Design and Investigation of Electroacoustic Measuring Systems and Digital Audio Signal Processing Systems), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2014.

PATENTS AND PATENT APPLICATIONS

[Pat1] P. Bajurko, M. Bury, S. Kozłowski: *„Sposób kalibracji wektorowego systemu pomiarowego oraz zestaw kalibracyjny dla wektorowego systemu pomiarowego"* (A method of calibration of vector measurement system and calibration kit for such system), Patent no. PL 398727, Nov. 13, 2014.

[Pat2] P. Kopyt: *„Detektor promieniowania elektromagnetycznego o podniesionej czułości"* (Electromagnetic radiation detector with improved sensivity), Patent application P-409222, Aug. 20, 2014.

[Pat3] M. Szafran, E. Pawlikowska, E. Pietrzak, E. Bobryk, Y. Yashchyshyn, K. Godziszewski, J. Kozakiewicz, I. Ofat, J. Trzaska: *„Sposób wytwarzania przestrajalnych kompozytów ceramika-polimer dla elektroniki wysokich częstotliwości*" (Method of manufacturing of tunable ceramic-polymer composites for high frequency electronics), Patent application P-410683, Dec. 19, 2014.

[Pat4] Y. Yashchyshyn, N. Andrushchak, K. Godziszewski, O. Kushnir, A. Andrushchak: „Векторно-аналізаторний інтерференційний пристрій вимірювання діелектричної проникності матеріалів"(ang. „Interferometric measurement setup for determining of permittivity of materials using Vector Network Analyzer"), Ukrainian Patent Application 2014 00822, Jan. 29, 2014.

[Pat5] M. Ziembicki, P. Żabowski-Zychowicz, J. Marzec, K. Zaremba, A. Nawrot, A. Krypa: *„Sposób i urządzenie do łączenia włókien światłowodowych"* (A method and apparatus for connecting optical fibers), Patent no. PL 216879-B1, HENKEL Polska Ltd., the Institute of Radioelectronics, NCBJ, May 30, 2014.

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8. SCIENTIFIC EVENTS

8.1 Scientific events co-organized by the Institute

[Con1] *Krajowa Konferencja Radiokomunikacji, Radiofonii i Telewizji: KKRRiT 2014* (National Conference on Radiocommunications and Broadcasting) (Warsaw, Poland, Jun. 11-13, 2014), J. Modelski (chairman of the Programme Committee, session chair), S. Hahn, K. Zaremba (members of the Honour Committee), J. Cichocki (chairman of the Organizing Committee, member of the Programme Committee, session chair), Y. Yashchyshyn (member of the Programme Committee, session chair), A. Czarnecka, K. Snopek, K. Godziszewski, K. Ignasiak, J. Jarkowski, S. Kozłowski, R. Michnowski, S. Żmudzin (members of the Organizing Committee), A. Badawika, P. Bajurko, M. Berezowska, G. Bogdan, K. Bryłka, A. Buchowicz, V. Djaja-Jośko, G. Dziarmaga, D. Gryglewski, T. Kosiło, K. Kurek, M. Lewandowski, A. Łysiuk, R. Michnowski, J. Naruniec, P. Piasecki, T. Służewski, G. Szafrański, M. Wieczorek, J. Wilkowski, Ł. Zawadka (speakers).

[Con2] *13th IMEKO TC10 Workshop on Technical Diagnostics: Advanced Measurement Tools in Technical Diagnostics for Systems' Reliability and Safety* (Warsaw, Poland, Jun. 26-27, 2014), P. Bilski (member of the International Programme IMEKO-TC10 Committee and Local Organizing Committee), A. Bilski (member of the Local Organising Committee).

[Con3] *International Conference: Multimedia – Technology, Design, Management* in the frame of EEA Grants Projects within Development of Polish Universities measure of Scholarship and Training Fund, in conjunction with *5th International IP Management Forum* (Warsaw, Poland, Oct. 29-30, 2014), J. Modelski, W. Skarbek, J. Żera (members of the Steering and Programme Committee), A. Czarnecka, K. Ignasiak (organizers), P. Bogorodzki, W. Skarbek (speakers).

8.2. International scientific events

[Con4] *International Conference: TCSET 2014* (Lviv-Slavske, Ukraine, Feb. 25 - Mar. 1, 2014), Y. Yashchyshyn, K. Godziszewski (participant).

[Con5] *4th International Workshop on Magnetic Particle Imaging* (Berlin, Germany, Mar. 26-30, 2014), W. Smolik, P. Wróblewski (participants).

[Con6] *16th International Conference on Calorimetry in High Energy Physics: CALOR 2014* (Giessen, Germany, Apr. 6-11, 2014), M. Dziewiecki (speaker).

[Con7] *136th Convention of Audio Engineering Society* (Berlin, Germany, Apr. 26-29, 2014), Z. Kulka (participant).

[Con8] *16th Seminar: Computer Modeling in Microwave Power Engineering* (Karlsrűhe, Germany, May 10-14, 2014), P. Korpas (participant).

[Con9] *Warsaw Medical Physics Meeting* (Warsaw, Poland, May 15-17, 2014), A. Kubik, M. Marczak, Ł. Błaszczak, K. Werys (participant).

[Con10] *The Second International Workshop on Non-Intrusive Load Monitoring: NILM 2014* (Austin, USA, May 31-Jun 6, 2014), P. Bilski (speaker).

[Con11] *IEEE International Microwave Symposium* (Tampa, USA, May 25-Jun. 6, 2014), J. Modelski (member of the Scientific Committee, AdCom MTT-S IEEE), W. Gwarek, B. Salski (speakers).

[Con12] *4th International Conference: Information Technologies in Biomedicine* (Kamień Śląski, Poland, Jun. 2-4, 2014), D. Radomski (participant).

[Con13] *20th International Conference on Microwaves, Radar and Wireless Communications: MIKON 2014* (Gdańsk, Poland, Jun. 16-18, 2014), J. Modelski (opening session co-chair, and closing session chair), W. Gwarek, Y. Yashchyshyn (session co-chairs, members of Technical Program Committee, speaker), A. Badawika, P. Bajurko, B. Salski, G. Bogdan, K. Godziszewski, J. Kołakowski, P. Korpas, A. Łysiuk, P. Piasecki (speakers).

[Con14] *International Workshop on Multimedia-Technology, Design, Management* (Trondheim, Norway, Jun. 26, 2014), W. Skarbek (speaker).

[Con15] *International Travelling Summer School on Microwaves and Lightwaves* (Lyngby, Denmark, Jul. 5-11, 2014), Y. Yashchyshyn, K. Godziszewski, G. Bogdan, T. Karpisz (participants).

[Con16] *5th Open Meeting for the Hyper-Kamiokande Project* (Vancouver, Canada, Jul. 19-22, 2014), M. Dziewiecki, M. Ziembicki, A. Rychter (participants).

[Con17] *IEEE Region 8 Student and Young Professional Congress* (Kraków, Poland, Aug. 6-10, 2014), J. Modelski (plenary session I panelist).

[Con18] *The 2014 Conference on Brain Informatics and Health, and Web Intelligence Congress* (Warsaw, Poland, Aug. 11-14, 2014), K. Zaremba (member of the Programme Committee), P. Bogorodzki (Web Intelligence Congress panel organizer, member of the Program Committee), E. Piątkowska-Janko (member of the Program Committee), P. Płoński (participant).

[Con19] *The 2014 IEEE/WIC/ACM International Conference on Web Intelligence* (Warsaw, Poland, Aug. 11-14, 2014), P. Bogorodzki (panel organizer).

[Con20] *10th International Conference: Active Media Technology - AMT 2014* (Warsaw, Poland, Aug. 11-14, 2014), A. Świercz (speaker).

[Con21] *The XXXI General Assembly and Scientific Symposium of the International Union of Radio Science* (Beijing, China, Aug. 16-23, 2014), J. Modelski (president of URSI National Committee).

[Con22] *NUSOD 2014: 14th International Conference on Numerical Simulation of Optoelectronic Devices* (Palma de Mallorca, Spain, Sept. 1-4, 2014), B. Salski (speaker).

[Con23] *IMEKO Joint TC1-TC7-TC13 Symposium* (Lisbon, Portugal, Sept. 3-5, 2014), R. Z. Morawski (member of the International Program Committee, speaker, invited speaker - "General Introduction to the 2014 IMEKO TC1-TC7-TC13 Symposium").

[Con24] *7th Forum Acusticum 2014* (Cracow, Poland, Sept. 7-12, 2014), A. Rogowska, E. Kotarbińska, J. Żera, M. Lewandowski (speakers).

[Con25] *IMEKO-TC4 Symposium on Measurement of Electrical Quantities* (Benevento, Italy, Sept. 10-19, 2014), R. Z. Morawski (member of Advisory Board, Technical Board, Editorial Board, General Council, speaker).

[Con26] *International Conference on Computer Vision and Graphics: ICCVG 2014* (Warsaw, Poland, Sept. 15-17, 2014), W. Skarbek – invited speakers – "Shape from Motion (SfM) for Online 3D Face Modeling and Animation".

[Con27] *16th International Telecommunications Network Strategy and Planning Symposium* (Funcjal, Portugal, Sept. 16-21, 2014), Y. Yashchyshyn (participant).

[Con28] *15th International Symposium on New Trends in Audio and Video* (Wrocław, Poland, Sept. 25-27, 2014), Z. Kulka (speaker).

[Con29] *Joint 12th Russia/CIS/Baltic/Japan Symposium on Ferroelectricity and 9th International Conference Functional Materials and Nanotechnologies: RCBJSF - 2014-FM&NT* (Riga, Latvia, Sept. 29-Oct. 2, 2014), Y. Yashchyshyn, K. Godziszewski (speakers).

[Con30] *IV Smart Communications & Technology Forum* (Warsaw, Poland, Sept. 18, 2014), J. Modelski (parallel session moderator).

[Con31] *European Microwave Conference: EuMC 2014* (Rome, Italy, Oct. 3-9, 2014), J. Modelski (chair of session, member of the Steering Committee, General Assembly European Microwave Association, Administative Committee of IEEE Microwave Theory Techniques Society).

[Con32] *41 Międzynarodowa Konferencja i Wystawa PIKE 2014* (41st International Conference and Exhibition PIKE 2014) (Łódź, Poland, Oct. 6-8, 2014), J. Modelski (president of the Programme Council).

[Con33] *IEEE Imaging Systems and Techniques 2014* (Fira, Greece, Oct. 14-18, 2014), W. Smolik, P. Wróblewski (participant).

[Con34] *The 2014 U.S. Workshop on the PHYSICS and CHEMISTRY of II-VI MATERIALS* (Baltimore, USA, Oct. 21-23, 2014), A. Markowska (participant).

[Con35] *VII Warsaw International Media Summit* (Warsaw, Poland, Oct. 24-25, 2014), J. Modelski (participant).

[Con36] *2014 IEEE Nuclear Science Symposium and Medical Imaging Conference with the 21st Symposium on Room-Temperature Semiconductor X-Ray and Gamma-Ray Detectors* (Seattle, USA, Nov. 9-15, 2014), M. Dziewiecki, A. Rychter, M. Ziembicki (participants).

[Con37] *8th International Forum on Innovative Technologies for Medicine: ITMED 2014* (Supraśl, Poland Dec. 4-6, 2014), K. Zaremba (member of the Programme Committee, session chair), P. Bogorodzki (session chairs), W. Obrębski, J. Orzeł, B. Kossowski (participants).

8.3. National scientific events

[Con38] *Ogólnopolska Konferencja Operatorów Komunikacji Elektronicznej-PIKE 2014: 25-lecie Telewizji Kablowej* (National Conference on Electronic Communications Operators-PIKE 2014: 25th Anniversary of Cable Television) (Jachranka k/Warszawy may 26-28, 2014), J. Modelski (panelist).

[Con39] *X Szkoła-Konferencja Metologia Wspomagana Komputerowo: MWK 2014* (Xth School-Conference: Computer-aided Metrology) (Waplewo, Poland, May 27-30, 2014), R. Z. Morawski, W. Winiecki (members of the Scientific Committee).

[Con40] *XXIV Ogólnopolski Zjazd Dziekanów Wydziałów Elektrycznych, Elektroniki, Telekomunikacji, Automatyki i Robotyki oraz Informatyki* (XXIVth National Congress of Deans of Faculties: Electrical, Electronic, Telecommunications, Automation and Robotics, and Computer Science) (Warsaw, Poland, May 29-31, 2014), J. Modelski (invited speaker).

[Con41] *XIII Krajowa Konferencja Elektroniki* (XIIIrd National Conference on Electronics) (Darłówko Wschodnie, Poland, Jun. 9-16, 2014), J. Modzelewski (speaker).

[Con42] *Krajowe Sympozjum Telekomunikacji i Teleinformatyki: KSTiT 2014* (National Seminar on Telecommunications and Teleinformatics, Poznań, Poland, Sept. 3-5, 2014), J. Modelski, W. Skarbek (members of the Program Committee).

[Con43] *Fourth Edition Smart Communications & Technology Forum* (Warsaw, Poland, Sept. 18, 2014) W. Winiecki, R. Łukaszewski (participants).

[Con44] *46 Konferencja Naukowo-Techniczna Radiolokacji: KNTR'2014* (46th Scientific-Technical Conference on Radiolocation) (Warsaw, Poland, Oct. 27-28, 2014), J. Modelski (panel session chair).

[Con45] *XV Seminarium Stypendystów Fundacji Wspierania Rozwoju Radiokomunikacji i Technik Multimedialnych* (XVth Seminar Scholarship Holders of Foundation for the Development of Radiocommunications and Multimedia Technologies), (Warsaw. Poland, Dec. 10, 2014), J. Kołakowski, (session chair), A. Abramowski, A. Bartosik, K. Borkowski, G. Brzuchalski, M. Daniluk, V. Djaja-Jośko, M. Góralczyk, D. Kuchta, A. Łysiuk, J. Wilkowski, J. Wiśniewska, Ł. Zawadka (speakers).

[Con46] *II Kongres Elektryki Polskiej: "Elektryka i Cyfryzacja – Polska wobec wyzwań XXI wieku"* (Electronics and Digitization - Poland and the challenges of the twenty-first century) (Warsaw, Poland, Dec. 1-2, 2014), J. Modelski (member of the Honorary Committee).

9. AWARDS AND DISTINCTIONS

Honoris Causa Doctorate

for extraordinary achievements in the fields of radioelectronics – Lodz University of Technology (Politechnika Łódzka)
Józef Modelski, Prof. D.Sc.

State Medals

Medal Komisji Edukacji Narodowej (Medal of National Education Commitee)
Wiesław Winiecki, Prof. D.Sc.,
Krzysztof Zaremba, Prof. D.Sc.,

Medal Złoty za Długoletnią Służbę (Golden Medal for Long-lasting Service)
Tomasz Kosiło, PhD.,
Tomasz Jamrógiewicz, M.Sc.

Medal Brązowy za Długoletnią Służbę (Bronze Medal for Long-lasting Service), granted from the Warsaw University of Life Sciences.

Piotr Bilski, Ph.D.

Awards granted by national bodies

Polish Chamber for Electronic Communication

Golden PIKE
Józef Modelski, Prof. D. Sc.
Individual award for the outstanding achievements.

Polish Association of Electrical Engineering

The Paweł J. Nowacki Medal
Roman Z. Morawski, Prof. D.Sc.

Awards of the Rector

Roman Morawski, Prof. D.Sc., - I° team award
Wojciech Gwarek, Prof. D.Sc., - III° individual award
Wiesław Winiecki, Prof. D.Sc., - III° individual award
Krzysztof Zaremba, Prof. D.Sc. - I° individual award
Awards granted for the organizational achievements

Władysław Skarbek, Prof. D.Sc.

Individual I° didactic award for the elaboration of new academic course titled: *"Mathematics in Multimedia"*.

Paweł Bajurko, Ph.D.
Individual II° didactic award for the elaboration of new academic course titled: *"Radio Navigation and Identification Systems"*.

Michał Dziewiecki, Ph.D.
Individual III° scientific award for the Ph.D. thesis titled: *"Measurement-based Characterization of Multipixel Avalanche Photodiodes for Scintillating Detectors"*.

Marcin Lewandowski, Ph.D.
Individual III° scientific award for the Ph.D. thesis titled: *"The Short-time Analysis of the Performance of Sigma-delta SD Modulators"*.

Jacek Wojciechowski, Prof. D.Sc.,
Krzysztof Pieńkosz, Ph.D.
Team I° award for the book: *"Grafy i sieci"* (Graphs and networks).

Yevhen Yashchyshyn, D.Sc.,
Paweł Bajurko, Ph.D.,
Konrad Godziszewski, M.Sc.,
Anna Łysiuk, M.Sc.
Team I° scientific award for the researches on reconfigurable antennas, and radiocommunication systems and networks.
Grzegorz Pastuszak, Ph.D.,
Mariusz Jakubowski, Ph.D.,
Andrzej Abramowski, M.Sc.,
Grzegorz Brzuchalski, M.Sc.,
Mikołaj Roszkowski, M.Sc.,
Michał Wieczorek, M.Sc.
Team I° scientific award for the elaboration of hardware codecs for remote control of robots.
Krzysztof Kurek, Ph.D.,
Paweł Bajurko, Ph.D.,
Marcin Piasecki, Ph.D.,
Adam Rudziński, Ph.D.,
Rafał Szumny, Ph.D.,
Marcin Darmetko, M.Sc.,
Kamil Bryłka, M.Sc.
Team II° scientific award for the elaboration of communication systems in application of the security and disaster.

Kajetana Snopek, D.Sc.,
Marek Bury, Ph.D.,
Wojciech Kazubski, Ph.D.,
Andrzej Podgórski, Ph.D.,
Karol Radecki, Ph.D.,
Henryk Chaciński, M.Sc.
Team II° didactic award for the textbook titled: *"Sygnały, modulacje i systemy – laboratorium"* red. K. Snopek (Signals, modulations and systems – laboratory).

Award of the students of the Faculty

"Golden Chalk" Award
Jerzy Kołakowski, Ph.D.,
Jacek Naruniec, Ph.D.

Award of *the Foundation for the Development of Radiocommunications and Multimedia Technologies* in the Ph.D. competition

Marcin Lewandowski,Ph.D.

Award of *the Foundation for the Development of Radiocommunications and Multimedia Technologies* in the Young Authors' competition

Jakub Wilkowski, B.Sc.,
The first award for the paper titled: *"Antena mikropaskowa zasilana linią koplanarną dla WLAN IEEE 802.11 ad"* (Microstrip Antenna Fed with Coplanar Line for WLAN IEEE 802.11 ad).

Konrad Godziszewski, M.Sc.,
The preference paper titled: *"Zmodyfikowana metoda pomiaru przenikalności elektrycznej w zakresie subterahercowym z wykorzystaniem wektorowego analizatora obwodów"* (Modified Method of Permittivity Measurement in sub-Terahertz Band using Vector Network Analyzer).

Scholarships of *the Foundation for the Development of Radiocommunications and Multimedia Technologies*

For preparing Ph.D. Thesis
A. Abramowski
G. Brzuchalski
A. Łysiuk

For preparing M.Sc. Thesis
A. Bartosik, K. Borkowski, V. Djaja-Jośko, M. Góralczyk, D. Kuchta, Ł. Zawadka

For preparing B.Sc. Thesis
M. Daniluk, J. Wilkowski, J. Wiśniewska

10. STATISTICAL DATA (for Dec. 31st of each year)

SPECIFICATION	2010	2011	2012	2013	2014
academic staff [posts] total	62,08	65,5	64,55	60,68	60,68
tenured professors	4,5	4,5	4,5	5	6
professors	8	9	9	7,5	5,5
associate professors	0,5	0	1	0	2,75
assistant professors	38,75	41,6	41,65	39,90	37,90
readers	4,33	4,25	2,25	1	1
senior lecturers	4	4	3,5	4,53	4,53
assistants	2	2,15	2,65	2,75	3
Ph.D. students [persons] total	39	37	34	42	39
regular, the third level studies	23	23	19	30	28
without scholarship	16	14	15	12	11
technical and administrative staff [posts] total	18,4	19,2	17,6	19,75	17,25
senior R&D associates	2,9	2,5	2,5	1,75	1,25
R&D associates	4,75	4,35	4	5,5	5,5
administrative associates	9	10,35	9,1	10,5	9,5
service workers	2	2	2	2	1
temporary staff (projects: Proteus, Lider, ENIAC)	12,5	8,1	6,8	4,3	0
library resources books (volumes)	16055	10993	11140	11165	11181
books (titles)	8888	7204	7251	7276	7292
journals (subscribtions)	83	83	83	83	83
teaching activities basic courses	67	67	69	69	61
advanced courses	27	23	34	34	35
other courses	73	47	51	54	47
international projects, courses and lectures	2	2	2	3	3
research activities total	47	40	44	47	46
international	4	4	4	5	6
granted by Ministry	19	17	19	22	22
granted by the University	20	17	15	12	11
other	4	2	6	8	7
research projects budget **PLN:**	6 555168	4 987642	5 349402	5 536690	5 543090
Euro:		+ 1 500000*			
titles and degrees awarded Prof. titles	-	1	1	2	-
D.Sc. degrees	-	-	1	-	3
Ph.D. degrees	6	4	7	8	5
M.Sc. degree (regular studies + evening studies)	57+10	62+3	66+3	61+7	62+2
M.Sc. degree (studies in English)	2	-	-	1	1
B.Sc. degrees (regular studies + evening studies)	77+11	84+11	123+7	106+3	98+4
B.Sc. degrees (studies in English)	3	7	4	3	2
B.Sc. degrees (distant learning)	-	2	4	1	2
publications total	206	165	172	183	215
sci.-tech. books and chapters in books	9	6	5	7	8
sci.-tech. papers in journals - total	94	76	54	77	83
JCR-ICI list (IF>0)	20	20	26	36	44
MSHE list	67	55	27	38	36
in other journals	7	1	1	3	3
sci.-tech. papers in conference proceedings	74	74	95	74	83
other publications	29	9	18	25	41
research reports	22	24	28	29	18
scientific events attended by the staff	40	41	46	35	46

* investement from the Polish Science and Technology Fund into instrumentation - *Laboratory of Hyperpolarized Contrast for MRI*

APPENDIX:

EXPLANATORY NOTE ON POLISH ACADEMIC AND PROFESIONAL TITLES, DEGREES AND POSTS

This note contains the definitions of academic and professional titles, degrees and posts held by the staff of the Institute of Radioelectronics.

The following professional titles are awarded by Polish higher-education institutions:

- the ***inżynier (inż.)*** title, translated here as **B.Sc.**, is awarded to the students completing undergraduate studies in the fields of study related to engineering and technology;
- the ***magister (mgr)*** title, translated here as **M.Sc.**, is awarded to the students completing graduate studies in the fields of study related to sciences;
- the ***magister (mgr)*** title, translated here as **M.A.**, is awarded to the students completing graduate studies in arts and humanities;
- the ***magister inżynier (mgr inż.)*** title, translated here as **M.Sc.**, is awarded to the students completing graduate studies in the fields of study related to engineering and technology.

The academic degrees, the *doctor* and *doctor habilitowany* degrees, are awarded by the scientific councils of higher-education institutions or other scientific institutions.

The degree of ***doktor (dr)***, translated here as **Ph.D.**, is conferred on a person who:

- is the holder of the professional title of *magister* or *magister inżynier*;
- has successfully passed doctoral examinations in a selected research discipline;
- has submitted and successfully defended a doctoral thesis, favorably assessed by two reviewers.

The doctoral thesis, prepared under the supervision of a research adviser, should provide an original solution of a research problem and demonstrate general theoretical knowledge of the candidate in a given research discipline, as well as confirm his/her skills to conduct research work autonomously.

The degree of ***doktor habilitowany (dr hab.)***, translated here as **D.Sc.**, is conferred on a person who:

- is the holder of the academic degree of *doktor*;
- has remarkable scientific achievements;
- has significantly contributed to the development of a given research discipline;

and his/her contribution has been favorably assessed by four reviewers and approved by the scientific council of a higher-education institution or other scientific institution. The holder of the *doktor habilitowany* degree is authorized to be the advisor of Ph.D. students.

The academic title of ***profesor (prof.)*** is conferred by the President of the Republic of Poland. This title may be conferred on a person who:

- is the holder of the degree of *doktor habilitowany*;
- has scientific achievements significantly exceeding those required of *doktor habilitowany*;
- has remarkable academic achievements, including formation of academic staff.

The combination of the *profesor* title and the *doktor habilitowany* degree (***professor doktor habilitowany – prof. dr hab.***) is translated here as **Prof. D.Sc.**

The minimum requirements concerning the academic posts are as follows:

- for the post of ***asystent****,* translated here as ***Assistant*** − the professional title of *magister* or *magister inżynier*;
- for the post of ***starszy wykładowca***, translated here as ***Senior Lecturer*** − the *doktor* degree;
- for the post of ***docent****,* translated here as ***Reader*** − the *doktor* degree;
- for the post of ***adiunkt****,* translated here as ***Assistant Professor*** − the *doktor* degree;
- for the post of ***wykładowca***, translated here as ***Lecturer*** − the professional title of *magister* or *magister inżynier*;
- for the post of ***profesor nadzwyczajny****,* translated here as ***Professor*** − the *doktor habilitowany* degree;
- for the post of ***profesor zwyczajny****,* translated here as ***Tenured Professor*** − the *profesor* title.

More details concerning academic and professional titles, degrees and posts may be found in the Act on Higher Education od 2005 (with further adendmends)