INSTITUTE OF RADIOELECTRONICS

WARSAW UNIVERSITY OF TECHNOLOGY

FACULTY OF ELECTRONICS AND INFORMATION TECHNOLOGY

ANNUAL REPORT

2013

Warsaw, January 2014

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From the Director

Welcome to the 2013 edition of our Annual Report!

The last year has been very successful for the Institute practically in all the fields of its activity, but particularly in the staff advancement and research projects The main areas of research and development, in which the Institute has had a high position for several years and noted significant progress include: radiocommunications and radionavigations, multimedia techniques as well as biomedical engineering. High reputation of the Institute has been confirmed by several special recognitions, e.g. a team leaded by Wojciech Wojtasiak received a prestigious “2013 Innovation Laurel” award for the best innovative project “Microwave Transverter” in the Stanisław Staszic Nationwide Competition.

2013 was another successful year in both research and teaching activities – with 160 academic courses, 183 B.Sc. and M.Sc. theses (defended), 182 publications and 47 research projects with the budget of over 1,3 million Euros. A significant increase in the number of publications in journals with ISI JCR-list, as well as new 9 international and national grants enjoys in particular. Two of our professors, Zbigniew Kulka and Artur Przelaskowski, have received the title of professor.

Particular spotlight and significance should be given to new international projects*: Design of Enhanced Reliable GNSS/ UWB Personal Navigation Devices* within the framework of the EU Integrated Project FP 7, *Networked Infrastructure for Innovative Home Care Solutions* within the framework of the AAL Joint Programme, and *Care Support for Elderly and Disabled People by Radar Sensor Technology* within the Polish-Norwegian cooperation with Bergen University College. Other international projects include UE Integrated Project INTechFun (*Innovative Technologies of Multi–functional Materials and Structures for Nanoelectronics, Photonics, Spinotronics and Sensors*), ENIAC JU HEECS project (*High Efficiency Electronics Cooking Systems*), and, EU FP 7 Integrated Project CompHealth (*Radio Frequency Sensing for Non-Destructive Testing of Carbon Fibre Reinforced Composite Materials for Structural Health Monitoring*) were also continuated. For the few recent years, Institute of Radioelectronics had been developing a valuable and interesting international collaboration with CERN (*COMPASS Experiment*) and with Japan (*T2K Experiment*). In 2013, the biggest domestic project PROTEUS – *Integrated Mobile System for Counterrorism and Rescue Operations* – was completed with a great success.

The young crew and their scientific achievements deserve a special attention. The past year will be remembered as the year of eight successful Ph.D. dissertations defenses. Three D.Sc. monographs have been completed, which enabled the initiation of the habilitation procedures. Particularly, valuable is the awarding of a special research grant within the Iuventus Plus Programme to Bartłomiej Salski, Ph.D, by the National Centre of Research and Development (NCBiR) and research grant to Tomasz Filipek, M.Sc., funded by the Foundation for Polish Science.

I would like to sincerely thank all the co-workers of the Institute of Radioelectronics for their deep involvement, hard work and dedicated service. All the achievements that we were able to attain in the previous year, ought to be attributed to our excellent, highly-motivated staff. I would also like to express a special gratitude to our Grantors, Sponsors, all the Co-operators and Friends of the Institute, without whom we would have not been able to achieve our aims.

Warsaw, January 2014

Professor Józef Modelski

Classification of publications presented in this Report
is in accordance with the rules in force in 2013

Contents

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 three well-defined specializations: radiocommunications, multimedia, and biomedical engineering. 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:

Józef Modelski, Prof. D.Sc., Tenured Professor
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Secretariat:

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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, Financial Section, 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 (0.5 from Oct. 2013)
Wiesław Winiecki, Prof. D.Sc., Professor
Jan Żera, D.Sc., Professor
Piotr Bilski, Ph.D., Assistant Professor (0.75)
Ewa Kotarbińska, Ph.D., Assistant Professor (0.25)
Robert Łukaszewski, Ph.D., Assistant Professor
Krzysztof Mroczek, Ph.D., Assistant Professor
Maria Tajchert, Ph.D., Assistant Professor (0.4)
Piotr Bobiński, Ph.D., Assistant Professor (till Sept. 2013), Senior Lecturer (from Oct. 2013)

Junior academic staff

Marcin Lewandowski, M.Sc. Assistant (0.75)

Technical staff

Piotr Nykiel, M.Sc., Senior Development Engineer

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;
- information security of distributed measuring systems;
- virtual instrumentation, plug-in boards for data acquisition, IEEE-488 equipment;
- modern real-time systems, eg.: cRIO, ETX, RTX.

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

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e-mail: W.Gwarek@ire.pw.edu.pl

Senior academic staff

Tadeusz Morawski, Prof. D.Sc., Tenured Professor (0.5)
Stanisław Rosłoniec, Prof. D.Sc., Professor
Małgorzata Celuch, Ph.D., Research Assistant Prof. (0.5 from Mar. 2013)
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)

Technical staff

Mirosław Lubiejewski, Foreman

Ph.D. students

Michał Gasztold, M.Sc., from Oct. 2012
Przemysław Korpas, M.Sc., from Feb. 2010
Marzena Olszewska, M.Sc., from Feb. 2010

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 2013 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

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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 (from Oct. 2013)
Piotr Brzeski, Ph.D., Reader (till Mar. 2013), Assistant Professor (from Apr. 2013)
Roman Szabatin, Ph.D., Assistant Professor (0.75 till Sept. 2013, 0.5 from Oct. 2013)
Grzegorz Domański, Ph.D., Assistant Professor
Michał Dziewiecki, Ph.D., Assistant Professor (0.5, from Mar. 2013, 1 from Dec. 2013)
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)
Waldemar Smolik, Ph.D., Assistant Professor
Tomasz Jamrógiewicz, M.Sc., Senior Lecturer
Tomasz Olszewski, M.Sc., Senior Lecturer

Junior academic staff

Jacek Kryszyn, M.Sc. (0.5 from Dec. 2013)
Jarosław Orzeł, M.Sc. (0.5 from Dec. 2013)
Marcin Ziembicki, M.Sc., Assistant (0.75)

Technical staff

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

Ph.D. students

Krzysztof Chojnowski, M.Sc., from Feb. 2012
Wojciech Gradkowski, M.Sc., from Oct. 2010
Magdalena Jasionowska, M.Sc., from Feb. 2009
Łukasz Kołaszewski, M.Sc., from Feb. 2009
Bartosz Kossowski, M.Sc., from Oct. 2013
Jacek Kryszyn, M.Sc., from Oct. 2012
Wojciech Obrębski, M.Sc., from Oct. 2008
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 Professor (0.5 from Nov. 2013)

Jacek Cichocki, Ph.D., Reader

Paweł Bajurko, Ph.D., Assistant Professor (from Oct. 2013)

Marek Bury, Ph.D., Assistant Professor (0.25 from Oct. 2013)

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)

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)

Kajetana Snopek, Ph.D., Assistant Professor

Henryk Chaciński, M.Sc., Senior Lecturer (0.7 from Apr. 2013)

Tomasz Keller, Ph.D., Assistant Professor (till Sept. 2013), Senior Lecturer (0.33 from Oct. 2013)

Junior academic staff

Konrad Godziszewski, M.Sc., Assistant (0.5, from Nov. 2013)

Research staff of the EU Specific Targeted Research Project *PROTEUS*

Marcin Piasecki, Ph.D., Research Assistant Prof. (0.5 till Aug. 2013)

Technical staff

Anna Czarnecka, M.Sc., Senior Admin. Specialist (till Sept. 2013), Senior R&D Engineer (from Oct. 2013)

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 characteristics 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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Artur Przelaskowski, D.Sc., Professor (till Jul. 2013)

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., Reader (0.25 till Sept. 2013), Assist. Prof. (0,25 from Oct. 2013)

Tomasz Krzymień, M.Sc., Senior Lecturer (0.5)

Junior academic staff

Rafał Jóźwiak, M.Sc., Assistant (0.9, till Mar. 2013, 1 from Apr. 2013 to Sept. 2013)

Grzegorz Ostrek, M.Sc., Assistant (0.5, till Sept. 2013)

Research staff of the Innovative Economy project *PROTEUS*

Andrzej Abramowski, M.Sc., Research Assistant (0.95, till Dec. 2013).

Grzegorz Brzuchalski, M.Sc., Research Assistant (0.95, till Dec. 2013)

Mikołaj Roszkowski, M.Sc., Research Assistant (0.95, till Dec. 2013)

Michał Wieczorek, Resear. Assistant (0.95, till Dec. 2013)

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

Magdalena Jasionowska, M.Sc., from Oct. 2009

Grzegorz Ostrek, M.Sc., from Oct. 2008

Mikołaj Roszkowski, M.Sc., from Oct. 2010

Aleksandra Rutczyńska, M.Sc., from Oct. 2009

Adam Strupczewski, M.Sc., from Oct. 2013

Maciej Trochimiuk, M.Sc., from Oct. 2012

Michał Wieczorek, M.Sc., from Oct. 2010

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;
- spectrophotometric analysers of food;
- 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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Secretariat

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1.4.2. Environmental Noise Course

Head

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Secretariat

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1.5. Other Institute's Units

1.5.1 Library

Curator

Teresa Miąsek, M.A. (0.5)
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1.5.2 Accounting Department

Head

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Staff

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Dorota Podniesińska, M.A.
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Aleksandra Jefimowicz, M.A.
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(leave from Dec. 2013)

1.5.3 Supply Section

Staff

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Andrzej Skrzypkowski
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1.5.4 Office of the EU Specific Targeted Research Project PROTEUS

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[Edu90], [Edu91]; [Pro30]; [MSc22], [MSc42]; [BSc28], [BSc36], [BSc45], [BSc46], [BSc57], [BSc59], [BSc87], [BSc98]; [Pub81].

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[Edu10], [Edu11], [Edu23], [Edu24], [Edu25], [Edu81], [Edu100]; [Pro30]; [MSc5]; [BSc1]; [Pub108], [Pub152]; [Pat4].

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[Edu64], [Edu77], [Edu126]; [Pro25], [Pro37], [Pro43]; [MSc5], [MSc16], [MSc50]; [Pub26], [Pub50], [Pub53].

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[Pro2], [Pro29]; [BSc35], [BSc78]; [Pub93], [Pub102].

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[Edu14], [Edu46], [Edu50], [Edu111], [Edu124], [Edu125], [Edu129]; [Pro4], [Pro10], [Pro33]; [MSc49], [MSc53]; [BSc6].

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[Edu53], [Edu98]; [Pro6], [Pro7], [Pro30]; [MSc17], [MSc21], [MSc27], [MSc40], [MSc44]; [BSc25], [BSc71]; [Pub108].

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[Edu59], [Edu106], [Edu113]; [Pro15], [Pro20], [Pro29], [Pro39], [Pro41], [Pro44], [Pro45]; [MSc35], [MSc39], [MSc62]; [BSc37], [BSc60]; [Pub54].

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[Edu30], [Edu69]; [Pro1], [Pro2], [Pro17], [Pro18], [Pro24], [Pro29]; [BSc17], [BSc64]; [Pub35], [Pub54], [Pub66], [Pub93], [Pub100], [Pub125], [Pub126], [Pub143]; [Pat2], [Pat3].

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[Edu4], [Edu49], [Edu52], [Edu133]; [Pro34]; [MSc28]; [BSc95]; [Pub51].

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[Edu21], [Edu66], [Edu103]; [Pro4], [Pro10], [Pro33]; [MSc3], [MSc33], [MSc37]; [BSc7], [BSc13], [BSc86]; [Pub45], [Pub68], [Pub76], [Pub169], [Pub179].

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[Edu2], [Edu12], [Edu107]; [Pro6], [Pro7], [Pro30]; [BSc77].

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[Edu49], [Edu79], [Edu112], [Edu127], [Edu128]; [Pro34]; [MSc14]; [Pub72], [Pub175].

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[Edu39], [Edu137]; [Pro27].

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[Edu23], [Edu24], [Edu72], [Edu80], [Edu147], [Edu148]; [Pro27]; [Prof1]; [PhD2]; [BSc14], [BSc38], [BSc79]; [Pub3].

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[Edu14], [Edu55], [Edu109]; [Pro5], [Pro14], [Pro31]; [BSc23], [BSc89]; [Pub55], [Pub70], [Pub166].

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[Edu9], [Edu61], [Edu101], [Edu105], [Edu116], [Edu123]; [Pro6], [Pro7], [Pro30]; [MSc1], [MSc32], [MSc48]; [BSc9], [BSc50], [BSc82]; [Pub8], [Pub9], [Pub10], [Pub11], [Pub16], [Pub17], [Pub21].

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[Edu20], [Edu23], [Edu24], [Edu25], [Edu95], [Edu97]; [Pro6], [Pro7], [Pro30]; [PhD1]; [BSc83]; [Pub8], [Pub9], [Pub10], [Pub11], [Pub12], [Pub13], [Pub14], [Pub15], [Pub16], [Pub17], [Pub21].

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[Edu23], [Edu24], [Edu55], [Edu149], [Edu150], [Edu151], [Edu152]; [Pro14], [Pro21], [Pro26], [Pro31]; [PhD3], [PhD7]; [Pub32], [Pub55], [Pub56], [Pub57], [Pub1119], [Pub120], [Pub155], [Pub166], [Pub181].

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[Edu4], [Edu49], [Edu52], [Edu133]; [Pro34]; [MSc4]; [BSc3], [BSc8], [BSc52], [BSc93], [BSc94], [BSc96]; [Pub63], [Pub64], [Pub121].

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[Edu29], [Edu33], [Edu41], [Edu42]; [Pro9], [Pro19], [Pro36]; [BSc106a]; [MSc57]; [Pub39], [Pub65], [Pub84], [Pub85], [Pub122], [Pub123], [Pub182]; [Pat1].

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[Edu25], [Edu114]; [Pro29].

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M.Sc. ('90), Ph.D. ('95), D.Sc. ('04), Prof. Title (2013); computer-aided diagnosis in medicine, telemedicine, intelligence systems, multimedia techniques, signal & image processing, data compression, imaging informatics, compressed sensing; **Professor**, Television Division. Member of the IEEE Engineering in Medicine and Biology Society *(*EMBS*),* Member of Advisory Board of Machine Graphics & Vision ('10-); Int. Conf. Information Technologies in Biomedicine ITiB (07-) and Int. Conf. Computer Vision and Graphics (’10-); Tutorial assistance of Technique in Medicine Student Scientific Group ('08-13’).
[Edu8], [Edu18], [Edu74], [Edu88]; [Pro22], [Pro38]; [Prof2]; [MSc45], [MSc59].

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M.Sc. ('70), Ph.D. ('78); radio-frequency engineering and measurement; **Assistant Professor**, Radiocommunications Division.
Member of the National Committee of URSI ('90-); Member of the Scientific Advisory Board, Polish Association for the Blind ('95-).
[Edu49], [Edu117], [Edu131]; [Pro4], [Pro10], [Pro33]; [MSc55]; [BSc30], [BSc48]; [Pub51], [Pub72], [Pub75], [Pub175], [Pub178].

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M.Sc. ('96), Ph.D. (automatics and robotics '01), Ph.D. (medical science '06); mathematical modeling of physiological and disease processes, biostatistical methods, experiments design methods; **Assistant Professor**, Nuclear and Medical Electronics Division.
[Pro30]; [Pub136], [Pub137], [Pub157].

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[Edu15], [Edu78]; [Pro29], [PhD8]; [Pub73].

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[Pro29]; [Pub78].

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[Edu89]; [MSc15], [MSc31]; [BSc51], [BSc100]; [Pub34], [Pub165], [Pub177].

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[Edu16], [Edu56], [Edu64].

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[Edu31], [Edu47]; [Pro3], [Pro12], [Pro18], [Pro29]; [BSc27], [BSc97]; [Pub35], [Pub66], [Pub125], [Pub126], [Pub142], [Pub143], [Pub164], [Pub176]; [Pat3].

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[Pro14], [Pro30]; [BSc65], [BSc106].

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[Edu67], [Edu68], [Edu70], [Edu92]; [Pro37], [Pro40], [Pro43]; [PhD6]; [Pub29], [Pub42], [Pub99], [Pub124].

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[Edu48], [Edu73]; [Pro16], [Pro22], [Pro30]; [BSc15], [BSc33], [BSc84]; [Pub5], [Pub108], [Pub109], [Pub110], [Pub111], [Pub112], [Pub144], [Pub145], [Pub152], [Pub153]; [Pat4].

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[Edu57], [Edu58], [Edu131]; [Pro35]; [MSc6], [MSc52]; [Pub6], [Pub31], [Pub51], [Pub146].

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[Edu45]; [Pro29]; [BSc108].

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[Edu35], [Edu40], [Edu96]; [Pro16], [Pro30]; [MSc7]; [Pub108], [Pub109], [Pub110], [Pub112], [Pub152]; [Pat4].

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[Edu5], [Edu132], [Edu134], [Edu147], [Edu148]; [Pro27].

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[Edu1], [Edu34], [Edu60], [Edu82], [Edu108]; [Pro9], [Pro25], [Pro28]; [PhD4]; [MSc20]; [BSc10], [BSc19], [BSc44]; [Pub24], [Pub52], [Pub59], [Pub67], [Pub95], [Pub114], [Pub115], [Pub127], [Pub128], [Pub168].

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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-).
[Edu23], [Edu24], [Edu25], [Edu58], [Edu86]; [Pro35]; [MSc38]; [Pub7], [Pub25], [Pub88].

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M.Sc. ('84), Ph.D. ('98); microwave technique; **Assistant Professor**, Microwave and Radiolocation Engineering Division.
[Edu36], [Edu78]; [Pro15], [Pro20], [Pro23], [Pro29], [Pro39], [Pro41], [Pro44], [Pro45]; [BSc21]; [Pub54], [Pub78].

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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 MicrowaveTheory 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 Scientific and Programme Committee of the National Conference KKRRiT ('09-), recipient of a team award of the Rector (’13).
[Edu3], [Edu71], [Edu93]; [Pro9], [Pro14], [Pro21], [Pro32]; [MSc8]; [BSc88]; [Pub28], [Pub32], [Pub36],

[Pub47], [Pub49], [Pub55], [Pub61], [Pub71], [Pub82], [Pub98], [Pub116], [Pub125], [Pub149], [Pub155], [Pub156], [Pub161], [Pub163], [Pub166], [Pub167], [Pub170], [Pub171], [Pub172], [Pub173], [Pub174], [Pub180], [Pub181].

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M.Sc. ('81), Ph.D. ('90), D.Sc. ('03), Prof. Title (’12); biomedical engineering, nuclear electronics; **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-); Member (’05-) and Vice-chairman of the University Council Committee on Property and Finances ('12-); Member of the Scientific Board of the PhD Students and Young Scientists Conference *Young scientists towards the challenges of modern technology* (‘08-); Member of the Scientific Board of Inter. Forum on Innovative Technologies for Medicine ITMED (‘07-), Member of the Scientific Committee of the Symposium *New Trends in Audio and Video* (‘08-); 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-); recipient of a team award of the Rector (’13).
[Edu54], [Edu94], [Edu100]; [Pro6], [Pro7], [Pro8], [Pro30]; [PhD5]; [MSc13], [MSc26], [MSc36], [MSc60]; [BSc20], [BSc53], [BSc58]; [Pub8], [Pub9], [Pub10], [Pub11], [Pub12], [Pub13], [Pub14], [Pub15], [Pub16], [Pub17], [Pub18], [Pub19], [Pub20], [Pub21], [Pub130], [Pub134].

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M.Sc. ('76), Ph.D. ('90), D.Sc. ('04); acoustics, electroacoustics, psychoacoustics, noise control; **Professor**, Electroacoustics Division.
Member of the ISO Working Group – ISO/TC 159/S.C5/WG3 ('97-); Member of Polish Acoustical Society ('78-), European Acoustics Association ('01-), Acoustical Society of America ('90-); Member of the Committee on Acoustics, the Polish Academy of Sciences ('07-); Member of Scientific Council of the Central Institute for Labour Protection – National Research Institute ('09-), Member of Technical Committee KT 105: Electroacoustics of Polish Committee for Standarization ('09-), recipient of a team award of the Rector (’13).
[Edu38], [Edu87]; [Pro27]; [Pub4], [Pub106], [Pub117], [Pub139], [Pub140].

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Ph.D. Student	**(tutor)**
Andrzej Abramowski, M.Sc.	*(W. Skarbek)*
Anna Badawika, M.Sc.	*(J. Modelski)*
Adrian Bilski, M.Sc.*	*(J. Wojciechowski)*
Łukasz Błaszczyk, M.Sc.	*(J. Modelski)*
Grzegorz Bogdan, M.Sc.	*(Y. Yashchyshyn*
Grzegorz Brzuchalski, M.Sc.	*(W. Skarbek)*
Krzysztof Chojnowski, M.Sc.	*(K. Zaremba))*
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)*
Wojciech Gradkowski, M.Sc.	*(P. Bogorodzki)*
Daniel Grzywczak, M.Sc.	*(W. Skarbek)*
Grzegorz Gwardys, M.Sc.*	*(W. Skarbek)*
Magdalena Jasionowska, M.Sc.	*(K. Zaremba)*
Łukasz Kołaszewski, M.Sc.*	*(P. Bogorodzki)*
Przemysław Korpas, M.Sc.	*(W. Gwarek)*
Bartosz Kossowski, M.Sc.	*(P. Bogorodzki)*
Jacek Kryszyn, M.Sc.	(*K. Zaremba)*
Anna Łysiuk, M.Sc.	*(Y. Yashchyshyn)*
Wojciech Obrębski, M.Sc.*	*(K. Zaremba)*
Marzena Olszewska, M.Sc.	*(W. Gwarek)*
Jarosław Orzeł, M.Sc.*	*(P. Bogorodzki)*
Grzegorz Ostrek, M.Sc.*	*(W. Skarbek)*
Jakub Pach, M.Sc.	(*W. Winiecki)*
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)*
Aleksandra Rutczyńska, M.Sc.*	*(W. Skarbek)*
Andrzej Rychter, M.Sc.	*(J. Marzec)*
Adam Strupczewski, M.Sc.*	*(W. Skarbek)*
Maciej Trochimiuk, M.Sc.	*(W. Skarbek)*
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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** temporary research staff of the project LIDER;
*** temporary research staff of the ENIAC JU HEECS project

3. TEACHING ACTIVITIES

(the summer semester of the academic year 2012/2013 and the winter semester of the academic year 2013/2014)

3.1. Regular studies – Main Fields of Study:

1. Telecommunications
Specialization: Radiocommunications and Multimedia Technologies

Head

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2. Electronics
Specialization: Electronics and Information Technology in Medicine

Head

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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); 30h/sem.; W. Winiecki, P.Bobiński.

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

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

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

[Edu5] *Basics of Acoustics and Electroacoustics* (Podstawy akustyki i elektroakustyki); 30h; M. Tajchert (for Faculty of Mechatronics)

[Edu6] *Basics of Digital Technique* (Podstawy techniki cyfrowej – PTCY); 45h/sem.; K. Mroczek.

[Edu7] *Basics of Sound Techniques* (Podstawy techniki dźwiękowej – PTD); 45h/sem.; P. Bobiński.

[Edu8] *Basics of Image Diagnostics Engineering* (Podstawy inżynierii diagnostyki medycznej – PIDOM); 45h/sem.; A. Przelaskowski.

[Edu9] *Basics of Information Techniques* (Podstawy technik Informacyjnych – PTIB); 30h/sem.; R. Kurjata.

[Edu10] *Basics of Medical Imaging* (Podstawy obrazowania medycznego – POMED); 45h/sem.; P. Brzeski.

[Edu11] *Basics of Medical Imaging Techniques* (Podstawy technik obrazowania w medycynie – PTOM); 60h/sem.; P. Brzeski.

[Edu12] *Basics of Microprocessor Technique* (Podstawy techniki mikroprocesorowej – TMIK); 60h/sem.; K. Derzakowski B. Konarzewski.

[Edu13] *Basics of Programming* (Podstawy programowania – PRM); 60h/sem.; A. Podgórski.

[Edu14] *Basics of Radiocommunications* (Podstawy radiokomunikacji – PR); 45h/sem.; J. Cichocki, K. Kurek.

[Edu15] *Basics of Radiolocation and Radionavigation* (Podstawy radiolokacji i radionawigacji – PRIR); 45h/sem.; S. Rosłoniec.

[Edu16] *Basics of Image Techniques* (Podstawy techniki obrazowej – PTO); 45h/sem.; G. Galiński, M. Rusin.

[Edu17] *Biomedical Accelerators* (Akceleratory biomedyczne – ABM); 30h/sem.; S. Wronka.

[Edu18] *Computer Graphics* (Grafika komputerowa – GRK); 30h/sem.; A. Przelaskowski.

[Edu19] *Construction of High Quality Audio Equipment* (Konstrukcja urządzeń audio wysokiej jakości – KUA); 30h/sem.; P. Nykiel.

[Edu20] *Detection of Nuclear and Biomedical Signals* (Detekcja sygnałów biomedycznych i jądrowych – DSBJ); 60h/sem.; J. Marzec.

[Edu21] *Digital Cellular Systems* (Cyfrowe systemy komórkowe – CSK); 45h/sem.; J. Kołakowski.

[Edu22] *Digital Circuits* – EDC1; 30h/sem.; P. Miazga (English-medium studies).

[Edu23] *Diploma Seminar for Graduate Students 1* (Seminarium dyplomowe magisterskie 1 – SDM1); 30h/sem.; P. Brzeski, Z. Kulka, J. Marzec, J. Modelski, J. Wojciechowski.

[Edu24] *Diploma Seminar for Graduate Students 2* (Seminarium dyplomowe magisterskie 2 – SDM2); 30h/sem.; P. Brzeski, Z. Kulka, J. Marzec, J. Modelski, J. Wojciechowski.

[Edu25] *Diploma Seminar for Undergraduate Students* (Seminarium dyplomowe inżynierskie – SDI); 30h/sem.; P. Brzeski, J. Marzec, T. Morawski, J. Wojciechowski.

[Edu26] *Digital Systems* (Układy cyfrowe – UCYF); 15h/sem.; K. Mroczek, T. Olszewski.

[Edu27] *Electronic Circuits Supply* (Zasilanie układów elektronicznych - ZUE); 45h/sem.; M. Mikołajewski.

[Edu28] *Event-Driven Programming* (Programowanie zdarzeniowe – PROZE); 45h/sem.; K. Ignasiak.

[Edu29] *Ethical Aspects of Research and Engineering* – EEARE; 30h/sem; R. Z. Morawski (English-medium studies).

[Edu30] *Fields and Waves* (Pola i fale – POFA); 45h/sem.; W. Gwarek.

[Edu31] *Fields, Waves and Antennae* – EFWA; 60h/sem.; B. Salski (English-medium studies).

[Edu32] *Influence of Electromagnetic Waves on Living Organisms* (Oddziaływanie fal elektromagnetycznych na organizmy żywe – OFE); 30h/sem.; K. Derzakowski.

[Edu33] *Introduction to Numerical Methods* (Wstęp do metod numerycznych – WNUM); 45h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski.

[Edu34] *Measurement Systems* (Systemy pomiarowe – SPOM); 30h/sem.; W. Winiecki.

[Edu35] *Medical Electronic Instrumentation* (Elektroniczna aparatura medyczna – EAME); 60h/sem.; T. Olszewski, R. Szabatin, T. Jamrógiewicz, E. Piątkowska-Janko.

[Edu36] *Microwave Technique (*Technika mikrofalowa – TMO); 60h/sem.; W. Wojtasiak.

[Edu37] *Multi-service and Multimedia Networks* – EMSMN; 60h/sem.; T. Keller (English--medium studies).

[Edu38] *Music Acoustics* (Akustyka muzyczna – AM); 30h/sem.; J. Żera.

[Edu39] *Noise Control* (Ochrona przed hałasem – OPH); 30h/sem.; E. Kotarbińska (for Faculty of Environmental Engineering).

[Edu40] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej – TMENU); 30h/ sem.; R. Szabatin.

[Edu41] *Numerical Methods* (Metody numeryczne – MNUB); 45h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski.

[Edu42] *Numerical Methods* – ENUME; 60h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski (English-medium studies).

[Edu43] *Object-oriented Programming M* (Programowanie obiektowe M – PROE); 60h/sem.; J.Naruniec.

[Edu44] *Object-oriented Programming of Multimedia Applications in Java (*Java – obiektowe programowanie aplikacji multimedialnych – OPA); 45h/sem.; K. Ignasiak.

[Edu45] *Operating Systems* (Systemy operacyjne – SOE); 15h/sem.; M. Sypniewski.

[Edu46] *Orientation* (Orientacja – ORM); 15h/sem.; J. Cichocki.

[Edu47] *Physics 2* – EPHY2; 60h/sem.; B. Salski (English-medium studies).

[Edu48] *Programming Languages* (Języki programowania - JP); 75h/sem.; W. Smolik.

[Edu49] *Radiocommunication Systems* (Systemy radiokomunikacyjne – SRKO); 45h/sem.; H. Chaciński, T. Kosiło, J. Modzelewski, W. Kazubski, K. Radecki.

[Edu50] *Radioelectronics Measurements (*Miernictwo radioelektroniczne – MR); 45h/sem.; J. Cichocki.

[Edu51] *Radio Networks and Systems* (Systemy i sieci radiowe – SISR); 45h/sem.; T. Keller.

[Edu52] *Radio Receiving Technique* (Technika odbioru radiowego – TOR); 60h/sem.; W. Kazubski, J. Modzelewski.

[Edu53] *Radiological Apparatus in Medical Diagnostics* (Aparatura radiologiczna w diagnostyce medycznej – ARDM); 30h/sem.; G. Domański.

[Edu54] *Radiology and Nucleonics* (Radiologia z nukleoniką – RN); 45h/sem.; K. Zaremba.

[Edu55] *Satellite Communications* (Łączność satelitarna – LS); 45h/sem.; K. Kurek, J. Modelski.

[Edu56] *Selected Problems of Modern Television* (Wybrane zagadnienia współczesnej telewizji – WZWT); 30h/sem.; M. Rusin.

[Edu57] *Signals and Systems* (Sygnały i systemy – SYGSY); 60h/sem.; K. Snopek.

[Edu58] *Signals, Modulations and Systems (*Sygnały, modulacje i systemy – SYMSE); 60h/sem.; J. Wojciechowski, K. Snopek.

[Edu59] *Simulations of Radioelectronics Circuits* (Symulacja układów radioelektronicznych – SUREL); 45h/sem.; D. Gryglewski.

[Edu60] *Software for Measuring Systems* (Oprogramowanie systemów pomiarowych – OSP); 60h/sem.; W. Winiecki, P. Bobiński.

[Edu61] *Software for Medical Systems (*Oprogramowanie systemów medycznych – OSM); 45h/sem.; R. Kurjata, T. Jamrógiewicz.

[Edu62] *Sound Recording Technique* (Dźwiękowa technika studyjna – DTS); 45h/sem.; M. Lewandowski.

[Edu63] *Signal Processors in Audio Techniques* (Procesory sygnałowe w technice audio – PSTA); 45h/sem; P. Bobiński.

[Edu64] *Television Systems* (Systemy telewizyjne – SYTE); 45h/sem.; A. Buchowicz, M. Rusin.

[Edu65] *Ultrasonography Instrumentation* (Aparatura ultrasonograficzna – AUS); 45h/sem.; R. Jóźwiak.

[Edu66] *UMTS System (System UMTS – UMTS);* 45h/sem.; J. Kołakowski.

[Edu67] *Visualization and Modeling in Multimedia* (Wizualizacja i modelowanie w multimediach – WIM); 45h/sem.; W. Skarbek.

3.1.2 Advanced courses

[Edu68] *Adaptive Image Recognition* – EADIR; 60h/sem.; W. Skarbek (English-medium studies).

[Edu69] *Analysis of Electromagnetics Fields in High-Frequency Devices* (Analiza pól elektromagnetycznych w urządzeniach wysokiej częstotliwości – APEM); 45h/sem.; W. Gwarek.

[Edu70] *Analysis and Multimedia Indexing* (Analiza i indeksowanie multimediów – AIM); 60h/sem.; W. Skarbek, J.Naruniec

[Edu71] *Antennae Theory and Design* (Teoria i projektowanie anten – TPA); 60h/sem.; Y. Yashchyshyn.

[Edu72] *Audio Equipment Investigation* (Badania urządzeń audio – BUA); 45h/sem.; Z. Kulka.

[Edu73] *Computed Tomography* (Tomografia komputerowa – TOM); 60h/sem.; W. Smolik.

[Edu74] *Computer - Aided Medical Image Diagnostics* (Komputerowe wspomaganie obrazowej diagnostyki medycznej – KWOD); 45h/sem.; A. Przelaskowski.

[Edu75] *Contemporary Heuristic Techniques* – ECOHT; 60h/sem.; P. Bilski (English-medium studies).

[Edu76] *Contemporary Heuristic Techniques* (Współczesne techniki heurystyczne – WMH); 60h/sem.; P. Bilski.

[Edu77] *Data Compression* (Kompresja danych – KODA); 45h/sem.; A. Buchowicz.

[Edu78] *Design of Microwave Circuits* (Projektowanie układów mikrofalowych – PUM); 60h/sem.; W. Wojtasiak, S. Rosłoniec.

[Edu79] *Design of Radiocommunication Systems* (Projektowanie układów radiokomunikacyjnych – PSRD); 60h/sem.; T. Kosiło.

[Edu80] *Digital Audio Signal Processing* (Cyfrowe przetwarzanie sygnałów fonicznych – CPSF); 45h/sem.; Z. Kulka.

[Edu81] *Digital Image Processing* (Cyfrowe przetwarzanie obrazów – CPOO); 30h/sem.; P. Brzeski.

[Edu82] *Distributed Measurement and Control Systems* (Rozproszone systemy pomiarowo-kontrolne – RSPK); 45h/sem.; W. Winiecki, R. Łukaszewski.

[Edu83] *Electromagnetic Compatibility* (Kompatybilność elektromagnetyczna – KE); 30h/sem.; P. Kopyt.

[Edu84] *Evolutionary Algorithms* – EEVAL; 60h/sem.; P. Miazga (English-medium studies).

[Edu85] *Evolutionary Algorithms (*Algorytmy ewolucyjne – AE); 45h/sem.; P. Miazga.

[Edu86] *Graphs and Networks* (Grafy i sieci – GIS); 60h/sem.; J. Wojciechowski.

[Edu87] *Hearing and Sound Perception* (Słyszenie i percepcja dźwięku – SPD); 30h/sem.; J. Żera.

[Edu88] *Informatics Systems in Medicine* (Systemy informatyczne w medycynie – SIM); 45h/sem.; A. Przelaskowski.

[Edu89] *Large-scale Measurement Methods in Molecular Biology* (Wielkoskalowe metody pomiarowe w biologii molekularnej – MPB); 45h/sem; T. Rubel.

[Edu90] *Magnetic Resonance Imaging* (Tomografia rezonansu magnetycznego – TRM); 45h/sem.; P. Bogorodzki.

[Edu91] *Magnetic Resonance in Biomedical Applications* (Rezonans magnetyczny w zasosowaniach biomedycznych – PWS16); 30h/sem.; P. Bogorodzki.

[Edu92] *Mathematics in Multimedia* (Matematyka w multimediach – MATMU); 60h/sem.; W. Skarbek.

[Edu93] *Modern Radio Transmission Techniques* (Nowe techniki transmisji radiowej – NTTR); 45h/sem.; Y. Yashchyshyn, S. Kozłowski.

[Edu94] *Neural Networks in Biomedical Applications* (Sieci neuronowe w zastosowaniach biomedycznych – SNB); 45h/sem., K. Zaremba.

[Edu95] *Noise and Electromagnetic Interference in Electronic Devices* (Szumy i zakłócenia w aparaturze elektronicznej – SZAE); 45h/sem., J. Marzec.

[Edu96] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej – TMN); 60h/sem.; R. Szabatin.

[Edu97] *Radiation Detection* (Detekcja promieniowania jonizującego – DEPJO); 30h/sem.; J. Marzec.

[Edu98] *Radiological Equipment in Medical Diagnostics* (Aparatura radiologiczna w diagnostyce medycznej – ARDM); 30h/sem.; G. Domański.

[Edu99] *Radio Navigation and Identification Systems* (Radiowe systemy lokalizacji i identyfikacji – RADS); 45h/sem.; P. Bajurko.

[Edu100] *Selected Techniques of Medical Imaging* (Wybrane techniki obrazowania medycznego – PW-S5); 30h/sem.; Ph.D. studies, P. Brzeski, K. Zaremba.

[Edu101] *Telemedical Systems* (Systemy telemedyczne - TELM); 45h/sem., R. Kurjata.

[Edu102] *Ultrasound Instrumentation* (Aparatura ultrasonograficzna – AUS); 30h/sem.; R. Jóźwiak.

[Edu103] *Ultrawideband Technologies* (Techniki ultraszerokopasmowe –TUSP); 45h/sem., J. Kołakowski.

3.2. Special courses

3.2.1 Engineer Degree Evening Studies on Radiocommunications and Multimedia Technologies

[Edu104] *Antennae* (Anteny – ANM); 30h/sem.; semester 4; H. Chaciński.

[Edu105] *Basics of Computer Techniques* (Podstawy techniki komputerowej – PKOM); 45h/sem.; semester 1; R. Kurjata.

[Edu106] *Basics of High-Frequency Techniques* (Podstawy techniki w.cz. – PTWM); 60h/sem.; semester 3; D. Gryglewski.

[Edu107] *Basics of Logical Circuits and Microprocessor Technique* (Układy logiczne i podstawy techniki mikroprocesorowej – PULM); 60h/sem.; semester 4; B. Konarzewski.

[Edu108] *Basics of Metrology* (Podstawy metrologii – PMEM); 45h/sem.; semester 1; W. Winiecki.

[Edu109] *Basics of Satellite Communications* (Podstawy łączności satelitarnej – SATM); 15h/sem.; semester 4; K. Kurek.

[Edu110] *Circuits and Signals* (Obwody i sygnały – OSRM); 45h/sem.; semester 2; M. Dziewiecki.

[Edu111] *Digital Cellular Systems* (Cyfrowe systemy komórkowe – CSKM); 36h/sem.; semester 7; J. Cichocki.

[Edu112] *Digital Signals Transmission* (Cyfrowa transmisja sygnałów – CTSM); 45h/sem.; semester 5; T. Kosiło.

[Edu113] *Electronic Circuits* (Układy elektroniczne – UEM); 45h/sem.; semester 3; D. Gryglewski.

[Edu114] *Fields and Waves* (Pola i fale – PFM); 60h/sem.; semester 2; T. Morawski.

[Edu115] *Internet Techniques* (Techniki Internetowe – TINM), 30h/sem.; semester 7; K. Ignasiak.

[Edu116] *Introduction to Programming* (Wstęp do programowania – WPRM); 15h/sem.; semester 2; R. Kurjata.

[Edu117] *Materials and Elements* (Materiały i elementy – MEM); 15h/sem.; semester 4; K. Radecki.

[Edu118] *Multimedia Applications* (Aplikacje multimedialne – AMRM); 30h/sem.; semester 5; K. Ignasiak.

[Edu119] *Multimedia Computer Systems* (Multimedialne systemy komputerowe – MSKM); 30h/sem.; semester 4; T. Jamrógiewicz.

[Edu120] *Multimedia Techniques* (Techniki Multimedialne – TMM); 30h/sem.; semester 6; G. Galiński.

[Edu121] *Numerical and Statistical Techniques* (Techniki obliczeniowe i symulacyjne – TOSM); 30h/sem.; semester 4; A. Miękina.

[Edu122] *Programmable Digital Devices* (Programowalne układy cyfrowe – PUCM); 30h/sem.; semester 5; M. Ziembicki.

[Edu123] *Programming* (Programowanie – PMRM); 30h/sem.; semester 3; R. Kurjata.

[Edu124] *Project 1* (Projekt 1 – PJUM); 30h/sem.; semester 5; J. Cichocki.

[Edu125] *Project 2* (Projekt 2 – PSRM); 60h/sem.; semester 6; J. Cichocki.

[Edu126] *Radiodiffusion Systems* (Systemy radiodyfuzyjne – SRDM); 60h/sem.; semester 6; A. Buchowicz, H. Chaciński.

[Edu127] *Radiocommunication Systems 1* (Systemy radiokomunikacyjne 1 – SRKM); 60h/sem.; semester 6; T. Kosiło.

[Edu128] *Radiocommunication Systems 2* (Systemy radiokomunikacyjne 1 – SRKM); 60h/sem.; semester 7; T. Kosiło.

[Edu129] *Radioelectronics Measurements* (Miernictwo radioelektroniczne – MRM); 45h/sem.; semester 5; J. Cichocki.

[Edu130] *Rules of Industrial Property* (Prawa własności przemysłowej – PWPR); 15h/sem.; semester 7; M. Bury.

[Edu131] *Signals and Modulations* (Sygnały i modulacje – SMRM); 60h/sem.; semester 3; K. Snopek, K. Radecki.

[Edu132] *Sound Techniques* (Techniki dźwiękowe – TDRM); 30h/sem.; semester 7; M. Tajchert, P. Bobiński.

[Edu133] *Technique of Emission and Receiving* (Technika emisji i odbioru – TEM); 45h/sem.; semester 5; J. Modzelewski, W. Kazubski.

3.2.2. Environmental Noise Course

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

[Edu134] *Basics of Acoustics* (Podstawy akustyki); 25h; M. Tajchert, A. Leszczyński.

[Edu135] *Basics of Statistics* (Podstawy statystyki); 10h; M. Kirpluk.

[Edu136] *Environment Noise Prediction* (Prognozowanie emisji hałasu w środowisku); 10h; M. Kirpluk.

[Edu137] *Noise in the Workplace* (Hałas w środowisku pracy); 6h; E. Kotarbińska.

[Edu138] *Legal Environment Noise Regulations* (Regulacje prawne w zakresie ochrony środowiska przed hałasem); 4h; M. Wojciechowska.

[Edu139] *Noise Measuring and Monitoring Methods* (Metody pomiaru i monitorowania hałasu); 16h; M. Kirpluk, J. Maciejczyk, P. Tomczyk.

[Edu140] *Noise Control* (Zabezpieczenia akustyczne); 10h; J. Sikora, G. Makarewicz.

[Edu141] *Human Health Effects of Noise* (Wpływ hałasu na organizm ludzki); 4h; Z. Koszarny.

[Edu142] *Noise Mapping* (Mapy akustyczne); 6h; J. Grabowski.

[Edu143] *Research Laboratories Accreditation* (Akredytacja laboratoriów badawczych); 6h; M. Szeląg.

[Edu144] *Selected Problems in Building Acoustics* (Wybrane zagadnienia z akustyki budowlanej); 16h; M. Niemas.

[Edu145] *Uncertainty of Noise Measurements* (Niepewność pomiarów); 8h; M. Kirpluk.

[Edu146] *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)

[Edu147] *Basics of Sound Technique* (Podstawy techniki dźwiękowej); 30h/sem.; Z. Kulka, A. Leszczyński M. Tajchert.

[Edu148] *Systems and Devices of Sound Technique* (Urządzenia i systemy techniki dźwiękowej); 30h/sem.; Z. Kulka, A. Leszczyński, M. Tajchert.

Lectures and presentations given by the staff

[Edu149] *Wireless Communications via Satellite and its Services and Applications* **Józef Modelski** – principal lecturer of the academic course: *IEEE International Courses for Wireless Technology Professionals – "Satellite Communications"* (Macau, China Jan. 30 – Feb. 1, 2013).

[Edu150] *IEEE Today and Future Directions* the presentation given by **Józef Modelski** at IEEE Central European Student Branch Congress 2013 (Opole, Poland, May 13, 2013).

[Edu151] *Directions of Development of Electronics and Telecommunications* the presentation given by **Józef Modelski** at XXIIIrd National Congress of Deans of Faculties: Electrical, Electronic, Telecommunications, Automation and Robotics, and Computer Science) (Kielce, May 16-18, 2013).

[Edu152] *Emerging Antennas for Modern Communication Systems*, *Ferroelectric Ceramic-Polymer Composites for Microwave and Sub-THz Tunable Devices* the lectures given by **Józef Modelski** at Institute of Remote Sensing Equipment (Beijing, China Oct. 24, 2013).

4. RESEARCH PROJECTS

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 – Dec. 31, 2013
INTechFun, EU Integrated Project

This project is carried out at 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 is to integrate different semiconductors and technologies and develop new semiconductor devices based on creative and innovative technological solutions and designs. The project is 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 will answer 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 will represent a breakthrough innovation which currently does not exist on the market. HEECS will deliver a new concept Microwave Oven. The main project scope is 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 will be 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, will be built with miniaturised circuits. The thermal management of the RF power devices will also incorporate thermal / material aspects relevant to ensure reliability and miniaturisation within the hybrid transistor package. The project will also deliver 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. 01, 2014
CompHealth, FP 7, EU Integrated Project

This project is carried out at Institute of Radioelectronics and Institute of Control and Industrial Electronics, Faculty of Electrical Engineering, WUT. The main aim of this project is 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 technique will use 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.

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

[Pro6] **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 – Dec. 31, 2014
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.

[Pro7] **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 – Dec. 31, 2014
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.

[Pro8] **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 ciekłoargonowego detektora T600 eksperymentu ICARUS).
K. 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.

[Pro9] **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 cooperation 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 method for supervision of human beings is an alternative to the method 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.

[Pro10] **Networked Infrastructure for Innovative Home Care Solutions** (Infrastruktura sieciowa dla innowacyjnych rozwiązań w obszarze opieki domowej).
Jerzy Kołakowski, J. Cichocki, R. Michnowski, K. Radecki, 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 Researches

[Pro11] **Hardware Architectures for Real-Time Multi-Source Audiovisual Coding** (Architektury sprzętowe dla wieloźródłowego

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-viewpoint system in the future.

[Pro12] **Hybrid Modelling of Laser Action Phenomenon in Finite Difference Method in the Time Domain** (Modelowanie hybrydowe zjawiska akcji laserowej w oparciu o metodę różnic skończonych w dziedzinie czasu).
Bartłomiej Salski;
Apr. 04, 2013 – Apr. 03, 2015
Iuventus Plus Programme

As part of this project is planned to be a hybrid FDTD algorithm, based on semi-classical approach, describing the two-level atomic system, which can represent both the process absorption and gain. According to the author's knowledge of the project, the proposed hybrid approach was to so far published. The result of this project is therefore entirely novel approach to the analysis kinetic equations, using the advantages of full-wave FDTD method for solving equations eddy Maxwell for any geometry, but without a dramatic extension of the simulation resulting from a long relaxation time. This work contributes to greater dissemination of the FDTD method in the design process integrated laser structures, which has been dominated by the approximation method and will fill the niche market of design tools for non-linear elements of photonic integrated circuit.

[Pro13] **The Development of Linearization Methods of Microwave Impulse Power Amplifiers** (Opracowanie metod linearyzacji mikrofalowych impulsowych wzmacniaczy mocy).
Tomasz Filipek;
May 01, 2013 – Jan. 31, 2015
Funded by the Foundation for Polish Science

This project presents a new linearization methods of microwave impulsed power amplifiers depending on the defined characteristics of a radiocommunication system. With the aim of determining the effect, and the impact of analog-to-digital conversion on the detection accuracy is determined, with analysis of the transmitter stages. Also investigated are the effects of the phase noise and jitter of the external signal sources used in the receiving process, these being factors that limit the performance of modern digital radiocommunication systems, radar systems and high frequency measurement instruments.

4.2.3. Research grants

[Pro14] **Integrated Mobile System for Counter-terrorism and Rescue Operations** (Zintegrowany mobilny system wspomagający działania antyterrorystyczne i antykryzysowe).
Józef Modelski, Y. Yashchyshyn, M. Bury, K. Derzakowski, T. Keller, K. Kurek, J. Naruniec, G. Pastuszak, B. Sawionek, A. Abramowski, P. Bajurko, K. Bryłka, G. Brzuchalski, M. Darmento, M. Jakubowski, S. Kozłowski, A. Linkowski, B. Majewski, M. Morgoś, Ł. Mosdorf, M. Mosdorf, A. Jefimowicz, M. Klocek, A. Kurek, M. Roszkowski, A. Rudziński, R. Sikora, A. Skrzypkowski R. Szumny, M. Wieczorek;
Apr. 1, 2007 – Dec. 31, 2013
PROTEUS, Innovative Economy Project (Partially funded by MSHE)

The task of PROTEUS is to break a number of the technological barriers and to create a demonstrator of the system, which will offer a new quality of the actions in the critical situations. As a result of the planned project in the years 2009-2013 integrated system will come into being, which will include: unmanned plane to remote monitoring, three robots for various use, mobile command center.

[Pro15] **The Development of Anti-aircraft Artillery Radar Tracking Technology Demonstrator** (Opracowanie demonstratora technologii radaru śledzącego do kierowania artylerią przeciwlotniczą).
Daniel Gryglewski, W. Wojtasiak;
Mar. 04, 2011 – June 08, 2013
Funded by the National Centre for Research and Development

The project aim is to develop a tracking radar used for precision targeting anti-aircraft artillery. The mastering the production of the radar by the national radar industry would use it in more sets of anti-aircraft military systems. Currently, in the national systems such type, foreign radars are used, which are very expensive. The application domestic radar signify reduce the costs and the systems. In this way, systems can become affordable for domestic and foreign customers. The project is running in cooperation with BUMAR-ELEKTRONIKA.

[Pro16] **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.

[Pro17] **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.

[Pro18] **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;
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.

[Pro19] **Methods and Algorithms of Measurement Data Processing in Spectrophotometric Analysers of Food** (Metody i algorytmy przetwarzania danych pomiarowych w spektrometrycznych analizatorach żywności).
Roman Z. Morawski, A. Miękina, C. Niedziński, A. Podgórski, N. Obarski, G. Żukowska;
Mar. 11, 2010 – Mar. 01, 2013
Funded by the National Science Center

Spectrophotometric analysers of food are on the rise, both in terms of the growing number of their applications and in terms of the growing number of their models available on the market. Today, they are applied not only for qualitative and quantitative identification of food products and raw materials, but also for evaluation of the nutritional properties of food and beverages. Any spectrophotometric analyser of food is composed of a spectrophotometric transducer, a source of optical radiation, an output interface and a digital signal processor. During last decade, many miniature spectrophotometric transducers have appeared on the market. Their availability and relatively low prices open the prospects for developing a new class of industrial and personal analysers of food. The key problems to be solved now are related to the methods and algorithms of spectrophotometric data processing. The project is aimed at the development of the complex methodology for spectrophotometric data processing dedicated to NIR analysers of food and beverages.

[Pro20] **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.

[Pro21] **New Types of Smart Antennas with Digital Beamforming based on Electronically Reconfigurable Aperture** (Nowe rodzaje inteligentnych anten z cyfrowym kształtowaniem wiązki o rekonfigurowalnej elektronicznie aperturze).
Yevhen Yashchyshyn, P. Bajurko, H. Chaciński, K. Derzakowski, S. Kozłowski, J. Marczewski, J. Modelski, D. Tomaszewski;
Apr. 8, 2010 - Apr. 7, 2013
Funded by the National Science Center

Two main aspects of the project are as follows:
1. Comprehensive investigation, developing and realization of conventional antenna array with digital beamforming.
2. Comprehensive investigation, developing and realization of new type of antenna with reconfigurable aperture realized by means of surface diodes S-PIN. Technological issues regarding S-PIN diode structure and arrangement are included in the research.

[Pro22] **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 is an effective solution to the problem of computer image understanding related to the requirements of medical diagnosis. State of knowledge in this area will 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 is constructing semantic models at each stage of information transfer at different levels of abstraction. The goal is closing 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.

[Pro23] **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.

[Pro24] **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.

[Pro25] **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;
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.

4.2.4. Ph.D. grants

[Pro26] **Study of Digital Terrestrial Television Receiver Architectures for DVB-T2 Standard** (Badanie architektur odbiorników cyfrowej telewizji naziemnej standardu DVB -T2).
Józef Modelski, M. Dąbrowski;
Oct. 29, 2010 –Oct. 28, 2013
Funded by the National Science Center

The aim of the project is to develop comparative criteria of digital terrestrial television receivers in DVB-T2 standard and pointing out the best receiver architecture with respect to those criteria. In this project it is understood that a "receiver" consists of the tuner, which converts input signals into intermediate frequency and filters unwanted signals and the demodulator, which performs digital signal processing including channel estimation and channel decoding. Research conducted within this project will help to propose a detailed architecture of a DVB-T2 receiver.

4.3 Projects granted by the University

4.3.1 Statutory projects

[Pro27] **Design and Investigation of Electro-acoustic Measuring Systems and Digital Audio Signal Processing Systems** (Projektowanie i badania systemów ele-

ktroakustycznych oraz systemów cyfrowego przetwarzania sygnałów fonicznych)
Zbigniew Kulka, P. Bobiński, E. Kotarbińska, A. Leszczyński, M. Lewandowski, M. Tajchert, J. Żera;
Apr. 06, 2012– Nov. 30, 2013

The aim of the first part of work was to formulate the methodology for evaluation of alterations introduced in the musical pieces using synchronous sample rate converter and requantizer and conduct the psychoacoustic tests on a chosen group of listeners. The results for various measurement procedures, using both professional and amateur audio equipment, were analyzed. The outcome of the measurements enabled the specification of the relationship between a character of a particular kind of music and alterations audible to the listener. In the second task the three music recognition algorithms were tested in common computing environment. The carried out analysis covered such features of algorithms as efficiency, effectiveness, robustness and scalability. Subsequently, using the analysis results, some modifications have been proposed in order to improve performance of the recognition system. The aim of the third part of the work was to design and construction of matrix headphone mixer for recording studio. After it the objective parameters of mixer were measured and subjective sound quality was evaluated.

[Pro28] **Development of Stationary and Distributed Measuring Systems Designing Methods** (Rozwój metod projektowania stacjonarnych i rozproszonych systemów pomiarowych).
Wiesław Winiecki, P. Bilski, P. Czernik, R. Łukaszewski, K. Mroczek, J. Olszyna;
Apr. 06, 2012– Nov. 30, 2013

The overview of the modern computer-aided design methods for the measurement instruments and systems was continued. Studies on possible use of cryptographic methods to ensure information security of distributed measurement systems were performed. The new cryptographic methods for the secure distributed measurement systems were proposed. The two hardware and software platforms usable for programming of devices with embedded systems using reconfigurable CompactRIO system were investigated. The methodology for project management of software measurement and control systems was developed. Results of the research were presented in the international and national conferences and in the journal from the JCR list.

[Pro29] **Techniques for Modelling the Electromagnetic and Thermodynamic and Design 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, M. Lubiejewski;
Apr 06, 2012 – Nov. 30, 2013

The project concerned methods of analysis and design of circuits destined for microwave and optoelectronic circuits. This work continued summarizing the projects of previous years and popularizing the results obtained there on the technique of transmitting and receiving RF systems and radar techniques. 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. The research group taking part in the project have been awarded to "2013 Innovation Laurel" for the best innovative project, microwave transverter.

[Pro30] **Modern Techniques in Nuclear and Medical Electronics** (Nowoczesne techniki elektroniki jądrowej i medycznej).
Krzysztof 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;
Apr. 06, 2012 – Nov. 30, 2013

Automatic classification of dementia patients based on neuroimaging data
The aim of this study was to evaluate features determined from magnetic resonance imaging MRI (Magnetic Resonance Imaging) data in order to improved medical diagnosis of dementia. Evaluation was done on data obtained from the ADNI database (Alzheimer's Disease Neuroimaging Initiative). Neuroimaging data have been pre-processed and then various methods of automatic classification were tested.
Analysis of nonlinear deformation of cornea during intra-ocular pressure measurements
Noninvasive intra-ocular pressure measurements by means of reflected light measurements is an example of optical technique application in medicine. The cornea is reflected by strong air flux, exhausted from the nozzle. The computer program was prepared for simulation of nonlinear defromation of corea by means of finite element method.
Study of light sensor based on Geiger-mode micropixel avalanche photodiodes, based on deeply-buried potential micro-wells
The aim of the project was to characteize novel multipixel valanche photodiodes (MAPD) working in Geiger mode. During this year, an already existing measurement setup has been significantly modified. First, an analog path has been completely redesigned in order to improve interference immunity and noise performance. Second, a new light source has been used (i.e. picosecond laser). Finally, existing setup has been extended by adding an electrometr and mechanics allowing and electrometr and mechanics allowing moving the light stop with micro-meter precision. Successful preliminary measurements have also been performed.
Modelling of selected physiological processes
The work was concerned on a parametrization problem of the 4 elements vector of uterine bioelectrical signals (EHG) which used joint information contained in this vector. For selection of a proper class of parametization method a nonlinear dynamic of EHG signals was tested using surrogate linear signals. Lastly, a multivariate sample entropy applied to differentiated EHG signals was proposed for such parametrization. Moreover, robustness of a

multivariate sample entropy on abdominal muscles affection was studied.

Electrical tomography applied in medicine and industry

In the current year, the works on the subject have been focused on tasks as follows:

- development and implementation of a prototype measuring circuit can measure the sub-femtofarad capacitances;
- study (CdMn)Te detectors to build a mini-gamma camera hand-held to support cancer surgery.

[Pro31] **Methods of Modification AES Encryption Algorithm in Data Transmission Systems for Satellite Applications** (Metody modyfikacji algorytmu szyfrującego AES w systemach transmisji danych do zastosowań kosmicznych).
Józef Modelski, T. Keller, K. Kurek, M. Piasecki, K. Bryłka, M. Dąbrowski;
Apr. 06, 2012 – Nov. 30, 2013

The main goal of this project was a review of literature on the modification of the encryption algorithm for use in satellite systems. The project concerned methods of implementation VHDL code of AES algorithm, The errors has been corected by means of Reed-Solomon code.

[Pro32] **Further Development of Test Bench for Measurement in Millimeter and Subterahertz Frequency Band – Design of Standard Antennas** (Rozbudowa stanowiska pomiarowego do pomiarów w paśmie milimetrowym i subterahercowym – realizacja anten wzorcowych).
Yevhen Yashchyshyn, K. Derzakowski, M. Bury, P. Bajurko, A. Urzędowska, K. Godziszewski, B. Majewski;
Apr. 06, 2012 – Nov. 30, 2013

The work is continuation of previous statutory work. The aim of the project is to determine the type and structure of antennas that are best suited for applying in the laboratory set-up operating up to 500 GHz. The antennas are to be made and characterized during the work.

[Pro33] **Investigation of UWB Impulse Propagation in Selected Materials** (Badanie propagacji impulsów ultraszerokopasmowych w wybranych materiałach).
Jerzy Kołakowski, J. Cichocki, R. Michnowski, K. Radecki, W. Kiełek, S. Żmudzin, P. Makal, P. Ziętek;
Apr. 06, 2012 – Nov. 30, 2013

The project deals with application of UWB technology for investigation of materials. The project started with the survey of publications concerning the project topic. The next step consisted in analysis of ETSI requirements and test methods specified for devices intended for building material measurements. Within the project a laboratory stand for investigation of building materials was set up. It was used for measurements of UWB pulse propagation through the most popular building materials. The project report includes chosen results and conclusions.

[Pro34] **New Applications of High-Frequency Switch-Mode Tuned Power Amplifiers in Radio Transmitters and Industrial Electronics** (Nowe zastosowania kluczowych rezonansowych wzmacniaczy mocy w.cz. w nadajnikach radiowych i w elektronice przemysłowej).
Juliusz Modzelewski, H. Chaciński, W. Kazubski, T. Kosiło, M. Mikołajewski;
Apr. 06, 2012 – Nov. 30 2013

The operation of an amplitude modulator by a phase modulation method (so-called *ampliphase modulation* or *outphasing modulation*) with two resonant Class DE power amplifiers has been analysed. It has been shown that the Class DE amplifiers for the modulator should be designed for the operation with the duty cycle of the drain current D=0.25. The turn-on conditions of the switches at zero-voltage switching (ZVS) can be ensured for any phase shift if the parallel capacitance of the switches is reduced to 88 % of the value for the nominal (ZVS and ZCS) operation. Moreover, the required dead angle of the gate pulses of the transistors in both amplifiers is not varied with the phase changes. Methods and circuits of the dual-output phase modulator with the phase accelerated and the phase delayed symmetrically by a value in the range of $0 \div 90^0$ have been analysed. It has been shown that for the operating frequencies in the range of 1MHz with a rectangular output signal the best circuit of the phase modulator is composed of an integrated PWM modulator with a triangle waveform and two monostable multivibrators ensuring the required duty cycle ratio of the output signals. A dual-output phase modulator with integrated circuits MAX038, TL3016 and 74HC123 operating with a 1MHz rectangular output signal was built and tested. An effective design procedure of an improved self-oscillating Class E power generator has been proposed. In the proposed generator circuit values of the capacitors applied in the resonant network have been decreased approx. 20 times. Hence the cost of the power generator can be noticeably reduced. A 150W/6.78 MHz Class E power generator was designed with the proposed procedure, and then built and tested. The measured efficiency in the experimental circuit was high (91%). Moreover, an experimental wideband linear amplifier with the output power 20W for the band 26 – 29MHz with cheap transistor switches IRF510 has been designed, built and tested. Tests of 2D localization accuracy in the urban area have been also carried out with smart phones and freeware software.

[Pro35] **Investigation on Multidimensional Signals, Diagnostics and Networks** (Badania w zakresie sygnałów wielowymiarowych, metod diagnostyki i sieci).
Jacek Wojciechowski, S. Kozłowski, K. Snopek, A. Bilski;
Apr. 06, 2012 – Nov. 30, 2013

The research was conducted in the following fields:

- Multidimensional signals: analytic representation of multidimensional signals, reconstruction of multidimensional signals. The results were published in the habilitation dissertation .
- Diagnostics of complex analog systems. Support Vector Machine was implemented to the diagnostics of large systems and its suitability proved by test examples. Principal Component Analysis was applied to filter measurement data.
- A book “Graphs and Networks” has been edited and published by the publishing house “Panstwowe Wydawnictwa Naukowe. The book presents selected topics of contemporary graph theory applicable in engineering and the research results of the authors.

Detection in cognitive radio systems. The preliminary research in the field was focused on cyclostationary signals.

[Pro36] **Interpretation of Measurement Data – Methodology and Metametrological Aspects** (Interpretacja danych pomiarowych – metodyka i aspekty meta-metrologiczne).
Roman Z. Morawski, A. Miękina, A. Podgórski;
Apr. 06, 2012 – Nov. 30, 2013

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 spectrophotometric transducers, as well as some contributions to the history of measurement science and to the organisation of higher education in Poland. The results of the research accomplished have been partially published in two book chapters and in a journal paper; moreover they have been presented at two conferences.

[Pro37] **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;
Apr. 06, 2012 – Nov. 30, 2013

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 i 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 will allow the demonstration of efficiency and usefulness of particular hardware-functional profiles in distributed real-time audiovisual systems.

[Pro38] **Modelling for the Detection of Architecture Distortions in Diagnosis of Breast Cancer Symptoms using Complex Wavelet Domain** (Modelowanie zaburzeń architektury jako symptomu raka sutka z wykorzystaniem falek zespolonych).
Artur Przelaskowski, G. Ostrek, R. Jóźwiak, M. Jasionowska, A. Rutczyńska;
Apr. 06, 2012 – Nov. 30, 2013

The methods for the detection of architecture distortions (AD), particularly difficult findings in mammogram-based diagnosis of breast cancer symptoms were developed. For learning and modeling of AD symptoms and verification of optimized numerical descriptors, data sets of representative and reliable mammograms were used (mainly from the DDSM based – source: University of South Florid). About 170 cases of AD appearance and supplementary amount of approximately 130 cases of normal breast tissue were selected. The methodology of the performed research can be summarized by two essential issues: a) creation of diagnostic model of AD that contains five fundamental characteristics of radial spicules with malignancy (based on medical knowledge, literature review and our own experience in collaboration with physicians), b) design and implementation of numerical descriptors to calculate representative numerical features based on multidirectional and multiscale representation of breast tissue in complex wavelet domain (characteristics of amplitude and phase) and Gabor maps (characteristics of amplitude and orientation angle) to assure the invariance of the model. Finally, the successively optimized recognition method for AD pathological symptoms detection was developed and implemented (in Matlab). Experimental verification showed more than 70 % effectiveness of AD diagnosis. Developed ideas, realizations and the achieved results were presented in two (conference and journal) papers.

4.4 Other projects

[Pro39] **Delivery the Basic Frequency Generator for Klystron** (Dostawa generatora częstotliwości podstawowej do klistromu).
Wojciech Wojtasiak, D. Gryglewski;
Feb. 11, 2013 – Aug. 10, 2013
Funded by National Centre for Nuclear Research (Narodowe Centrum Badań Jądrowych).

The main goal of this project was to develop and construct the generator for klystron.

[Pro40] **Webcam Eye Tracking**
Władysław Skarbek, J. Naruniec, M. Kowalski;
Mar. 01, 2013 – Dec. 23, 2013
Funded by Samsung Electronics Polska Ltd.

The aim of the project was to refine the results of the gaze tracking algorithms developed in our previous work with Samsung R&D (WebCam Eye Tracking, 2012). Research includes 6D face pose estimation, face tracking and new gaze tracking methods. Goals of the project should be accomplished by the end of the year.

[Pro41] **Development Prototype Design and Implementation of High-frequency Amplifiers** (Opracowanie konstrukcji prototypów i wykonanie wymacniaczy wysokich częstotliwości).
Daniel Gryglewski, W. Wojtasiak;
Mar. 04, 2013 – Jul. 15, 2013
Funded by CAMSAT Gralak Przemysław

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

[Pro42] **Integrated Antenna with a Remotely Supplied Sensor** (Zintegrowana antena czujnika zasilanego zdalnie).
Paweł Kopyt;
Mar. 27, 2013 – Apr. 17, 2013
Funded by TELETEL Telecom. Anthens, Greece
The main goal of this project was to elaborate, construct and verify the integrated antenna supported with a remotely supplied sensor.

[Pro43] **Multimedia Materials Management System** (System zarządzania materiałami multimedialnymi).
Władysław Skarbek, K. Ignasiak, A. Buchowicz, G. Galiński;
Nov. 04, 2013 – Feb. 28, 2014
Funded by SCA Solutions
Details of the project cannot be published due to non-disclosure agreement with contractor.

[Pro44] **Analysis of the Impact of Building in the Area of the Okęcie Shopping Center to Identify the Primary and Secondary ASR9/MSSR and ASR 10/IRS20 Radars, of the Polish Air Navigation Services Agency in the Area of Okęcie Airport** (Wykonanie analizy w zakresie wpływu zabudowy w rejonie Centrum Handlowego Okęcie w Warszawie na wskazania radarów pierwotnego i wtórnego ASR9/ MSSR oraz ASR 10/IRS20 będących w zarządzaniu Polskiej Agencji Żeglugi Powietrznej w rejonie lotniska Okęcie).
Wojciech Wojtasiak, D. Gryglewski;
Oct. 10, 2013 – Nov. 30, 2013
Funded by STUDIO QUADRA Ltd.
The aim of the project was to predict the influence of the shopping center on the existing air-traffic control facilities.

[Pro45] **Analysis of the Impact of Building in the Area of Railway Station in Warsaw** (Wykonanie analizy w zakresie wpływu zabudowy w rejonie dworca kolejowego w Warszawie).
Wojciech Wojtasiak, D. Gryglewski;
Oct. 28, 2013 – Nov. 22, 2013
Funded by FS & Arcus Ltd.
The main goal of this project was to perform the analysis taking into account the impact of building next to railway station.

[Pro46] **Design the Experitise on Printing Antenna according to EPC Global Gen2 Standard Placed above to Weight Plane** (Opracowanie ekspertyzy dotyczącej działania anten drukowanych zgodnych ze standardem EPC Global Gen2 umieszczonych nad płaszczyzną masy).
Paweł Kopyt;
Nov. 29, 2013 – Dec. 06, 2013
Funded by the Polish Security Printing Works Ltd. (Polska Wytwórnia Papierów Wartościowych S.A.)
Details of the project cannot be published due to non-disclosure agreement with contractor.

[Pro47] **Design the Experitise on Improvement the Effectiveness of Printing Antenna Radiation Placed above to Weight Plane** (Opracowanie ekspertyzy dotyczącej sposobu poprawiania skuteczności promieniowania anten drukowanych umieszczonych nad płaszczyzną masy).
Paweł Kopyt;
Nov. 29, 2013 – Dec. 06, 2013
Funded by the Polish Security Printing Works Ltd. (Polska Wytwórnia Papierów Wartościowych S.A.)
Details of the project cannot be published due to non-disclosure agreement 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 heterogeneous 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 National 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 & Communication 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.

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 Telecommunications, 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

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 participate in different international and internal educational space projects. Main of them are: project of ESEO (European Student Earth Orbiter) micro-satellite supported by European Space Agency ESA and realized by students from European Universities. Students from Warsaw University of Technology

(WUT) are responsible for realization of on-board data handling OBDH subsystem, mechanical configuration of the satellite and operation of the satellite after launch;

- project of PW-Sat pico-satellite, first Polish satellite built by students of WUT, mainly members of Student Space Association and SKIK. The satellite will be launched in 2009 and it will test a new method of de-orbitation using unfoldable solar sail.

Biomedical and Nuclear Engineering Student Scientific Group

Ewa Piątkowska-Janko – 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 in Dec. 2005 by a group of students from Biomedical Engineering. They participated in "Faces of neuroscience" Conference at University of Warsaw.

Innovative Information Technologies Student Scientific Group

Przemysław Miazga – tutor.

The scope of interest of the Students' Circle for Innovative Informatics Technologies was to design a web-service which allow for remote access to the linear/nonlinear optimization package (solver) Cplex form ILOG Ltd. The service consist of a client application with ASP interface and a server link. All parts have been designed with NET technology (VS.NET 2003) on 64 bit platform.

Technique in Medicine Student Scientific Group

Artur Przelaskowski – tutor (till Jul. 2013).

Technique in Medicine Student Scientific Group – SKNTechMed (in Polish Studenckie Koło Naukowe Techniki w Medycynie) was formed in December 2008. The aim of this scientific group is to unite two different spheres: technique and medicine, that cannot perform duties separately.

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. Therefore we cooperate with LUDUS scientific group, which is located on Faculty of Education at the University of Warsaw. Together we are working on a project "Enigame", which is a city game supported by mobile technologies. 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 - 2013

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 - 2013

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. Professor Titles

[Prof1] Zbigniew Kulka – promoted to a professor title (Jan. 17, 2013).

[Prof2] Artur Przelaskowski – promoted to a professor title (Feb. 26, 2013).

5.2. Ph.D. Degrees

[PhD1] Michał Dziewiecki: *"Pomiarowa charakteryzacja wielopikselowych fotodiod lawinowych współpracujących z detektorami scyntylacyjnymi*" (Measurement-based characterization of multipixel avalanche photodiodes for scintillating detectors), Prof. **J. Marzec** (supervisor), Warsaw, Jan. 15, 2013.

[PhD2] Marcin Lewandowski: *"Krótkoczasowa analiza parametrów modulatorów sigma-delta stosowanych w cyfrowo-analogowym przetwarzaniu sygnałów fonicznych"* (The short-time analysis of the performance of sigma-delta SD modulators), Prof. **Z. Kulka** (supervisor), Warsaw, Dec. 12, 2013.

[PhD3] Roman Łapszow: *"Adaptive antenna model with vertical beamforming and horizontal antenna pattern selectivity for 1800 MHz bandwidth",* Prof. **J. Modelski** (supervisor), Warsaw, Nov. 12, 2013.

[PhD4] Jakub Olszyna: *„Analiza i projektowanie układów kryptograficznych przeznaczonych do sieci czujnikowych"* (Analysis and design of cryptographic circuits for sensor networks), Prof. **W. Winiecki** (supervisor), Warsaw, Jun. 24, 2013.

[PhD5] Adam Padeé: *"Rozproszone algorytmy ewolucyjne optymalizujące klasyfikację danych w eksperymentach fizyki wysokich energii"* (Distributed evolutionary algorithms optimizing the classification of data for high energy physics), Prof. **K. Zaremba** (supervisor), Warsaw, Nov. 12, 2013.

[PhD6] Michał Tomaszewski: *"Wizualizacja scen rzeczywistych w schemacie próbkowania funkcji plenoptycznej"* (Visualisation system for real 3D scenes using a scheme of plenoptic function sampling), Prof. **W. Skarbek** (supervisor), Warsaw, Jun. 18, 2013.

[PhD7] Paweł Ziętek: *"Wykorzystanie sygnałów impulsowych z modulacją częstotliwości w systemach lokalizacyjnych w warunkach silnej wielodrogowości"* (Application of frequency modulated pulses in positioning systems in the multipath propagation environment), Prof. **J. Modelski** (supervisor), Warsaw, Nov. 5, 2013.

[PhD8] Michał Żebrowski: *„Metody analizy wieloelementowych retransmisyjnych szyków antenowych"* (Analysis methods of reflectarray antennas), Prof. **S. Rosłoniec** (supervisor), Warsaw, Jun. 24, 2013.

5.3. M.Sc. Degrees

[MSc1] Radosław Ambroziak: *"Bezprzewodowy monitor upadku pacjenta. Analiza danych motorycznych oraz algorytm detekcji upadku"* (Wireless patient fall monitor. Motility data analysis and fall detection algorithm development), Assist. Prof. **R. Kurjata** (supervisor).

[MSc2] Grzegorz Andrejczuk: *"Poprawa jakości zdjęć cyfrowych za pomocą łączenia obrazów wykonanych przy różnych warunkach naświetlenia"* (Improving quality of digital pictures using merging pictures with different exposures), Assist. Prof. **G. Galiński** (supervisor).

[MSc3] Anna Badawika: *"Układ do detekcji i lokalizacji osób z wykorzystaniem ultraszerokopasmowego radaru"* (Ultra-wideband radar-based human detection and localization system), Assist. Prof. **J. Kołakowski** (supervisor).

[MSc4] Albert Białkowski: *„Szerokopasmowy przeciwsobny wzmacniacz mocy na zakres UKF - FM (87,5 - 108 MHz)"* (VHF - FM wideband push - pull power amplifier), Assist. Prof. **J. Modzelewski** (supervisor).

[MSc5] Anna Bieńko: *"Automatyczne wykrywanie lewej komory w badaniu scyntygraficznym"* (Automatic detection of left ventricule in radionuclide angiocardiography tests), Assist. Prof. **P. Brzeski** (supervisor).

[MSc6] Łukasz Błaszczyk: *"Analiza pracy serca z zastosowaniem metody znakowanego rezonansu magnetycznego oraz filtrów Gabora"* (Cardiac function analysis using tagged magnetic resonance imaging and Gabor filters), Assist. Prof. **K. Snopek** (supervisor), (M.Sc. degree with honours).

[MSc7] Marcin Bocian: *"Zastosowanie elektrochirurgii w dermatologii i kosmetologii"* (Electrosurgery - basic uses in dermathology and cosmethology), Assist. Prof. **R. Szabatin** (supervisor).

[MSc8] Grzegorz Bogdan: *"FPGA - Based Time - Modulated Linear Antenna Array",* Prof. **Y. Yashchyshyn** (supervisor).

[MSc9] Tomasz Cipkowski: *"Badanie i analiza efektywności protokołów routingowych w sieciach MANET"* (The study and analyse of efficiency of routing protocols in MANET networks), Senior Lecturer **T. Keller** (supervisor), (M.Sc. degree with honours).

[MSc10] Grzegorz Dziarmaga: *„Porównanie wielowątkowej kompresji Motion JPEG na platformie Azul Vega oraz w architekturze OpenCL"* (Comparison of concurrent Motion JPEG video compression on Azul Vega platform and in OpenCL architecture), Assist. Prof. **K. Ignasiak** (supervisor).

[MSc11] Michał Falszewski: *"Projekt systemu wyszukiwania informacji medycznych zorientowany kontekstowo"* (Context aware medical information retrieval system design), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[MSc12] Maciej Fijałkowski: *„Transmisja danych za pośrednictwem światła widzialnego"* (Data transmission utilizing artificial lighting), Assist. Prof.**T. Buczkowski** (supervisor).

[MSc13] Krzysztof Gomulski: *„Metody analizy parametrów przebiegu awarii w reaktorze"* (Methods for analysis of nuclear reactor malfunctions), Prof. **K. Zaremba** (superisor).

[MSc14] Michał Hajduczenia: *"Radio kongitywne - analiza wybranych algorytmów detekcji zajętości pasma radiowego przy wykorzystaniu odbiornika z układem Realtek RTL2832U"* (Cognitive radio - analysis of chosen spectrum sensing algorithms by using radio receiver containing a chip Realtek RTL2832U), Assist. Prof.**T. Kosiło** (supervisor).

[MSc15] Witold Januszewski: *"MetaMisTher - maszynowy metapredyktor do przewidywania wpływu mutacji niesynonimicznych na stabilność termodynamiczną białek"* (Human activities classification in sequences of joints positions using probablistic graphical models), Assist. Prof.**T. Rubel** (supervisor).

[MSc16] Artur Jóźwikowski: *„Deinterlacing - konwersacja obrazów z wybieraniem międzyliniowym na obrazy z wybieraniem kolejnoliniowym"* (Deinterlacing - the conversion of interlaced images into non – interlaced images), Assist. Prof. **A. Buchowicz** (supervisor).

[MSc17] Aleksandra Kiszko: *"Program do separacji EKG płodu od EKG matki"* (Fetal EKG separation program), Assist. Prof. **G. Domański** (supervisor).

[MSc18] Maciej Klikowski: *„Bezbateryjny ambulatoryjny moduł pulsoksymetru - dowód koncepcji"* (Battery-less ambulatory pulse oximeter module - proof of concept), Assist. Prof. **T. Buczkowski** (supervisor), studies in English.

[MSc19] Tomasz Klimczyk: *"Topology Information Distribution Protocol – Specification"*, Assist. Prof. **S. Kukliński** (supervisor), (M.Sc. degree with honours).

[MSc20] Małgorzata Kocot: *„Badanie możliwości wykorzystania technologii ZigBee do lokalizacji wewnątrz budynków"* (Examining the possibility of using ZigBee for indoor positioning), Prof. **W. Winiecki** (supervisor).

[MSc21] Dorota Korulczyk: *„Program do dwuwymiarowej symulacji transportu ciepła w tkankach metodą różnic skończonych"* (Program to simulate heat transport in tissues), Assist. Prof. **G. Domański** (supervisor).

[MSc22] Bartosz Kossowski: *„Lokalizowana spektroskopia rezonansu magnetycznego z wykorzystaniem techniki echa planarnego w trajektorii cylindrycznej"* (Nuclear magnetic resonance localized spectroscopy with echo planar circular trajectory), Prof. **P. Bogorodzki** (supervisor), (M.Sc. degree with honours).

[MSc23] Jakub Kotecki: *„Wpływ jednostronnego obciążenia lateralnego na chód człowieka"* (The influence of the unilateral load on the human gait), Assist. Prof. **J. Dusza** (supervisor).

[MSc24] Magdalena Anna Kowalska: *„Optimisation of the line geometry and optics of 100GeV proton beamline for CENF experiment at CERN",* Prof. **N. Golnik** (supervisor).

[MSc25] Kamil Koza: *„Wyszukiwanie obrazów z wykorzystaniem skalowalnego deskryptora koloru standardu MPEG-7"* (Image search using MPEG-7 scalable color descriptor), Assist. Prof. **G. Galiński** (supervisor).

[MSc26] Wioletta Kozłowska: *„Secondary beam particle focusing system for CERN neutrino facility"*, Prof. **K. Zaremba** (supervisor).

[MSc27] Paweł Król: *„Jednokanałowy pulsoksymetr do monitorowania pacjenta"* (Single channel pulse oximeter for patient monitoring), Assist. Prof. **G. Domański** (supervisor).

[MSc28] Grzegorz Krzyżanowski: *„Łącze satelitarne na pasmo ultrakrótkie działające w systemie APRS"* (UHF radio link operating in APRS system), Assist. Prof. **W. Kazubski** (supervisor).

[MSc29] Barbara Litwińska: *„Weryfikacja podpisu off – line"* (Off - line signature verification), Assist. Prof. **J. Putz-Leszczyńska** (supervisor), (M.Sc. degree with honours).

[MSc30] Paweł Loska: *„Projekt interfejsu MASTER OCP w środowisku testowym kontrolera SD 4"* (OCP MASTER interface design for test environment of SD - HOST 4 controller), Assist. Prof. **M. Rawski** (supervisor).

[MSc31] Patrycja Łach: *"Zastosowanie metody wektorów podpierających do identyfikacji białek w badaniach proteomicznych"* (Use of Support Vector Machine for Protein Identification in Proteomics), Assist. Prof. **T. Rubel** (supervisor).

[MSc32] Kamil Łęczycki: *„System do zdalnego zarządzania danymi medycznymi"* (System for remote management of medical data), Assist. Prof. **R. Kurjata** (supervisor).

[MSc33] Rafał Maksimiuk: *„Układ wyzwalania etykiet w ultraszerokopasmowym systemie lokalizacyjnym"* (Device for wireless triggering of tags in UWB positioning system), Assist. Prof. **J. Kołakowski** (supervisor).

[MSc34] Mariusz Mierzyński: *"System do oceny poprawności działania skanera MR wykorzystywanego do badań czynnościowych fMRI"* (System of evaluation of MR scanner function correctness used to functional MRI), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[MSc35] Piotr Narkun: *„Opracowanie modelu diody PIN do układów ograniczników na pasmo X"* (PIN diode model for X band limiters), Assist. Prof. **D. Gryglewski** (supervisor).

[MSc36] Kamil Michał Nawrot: *„Rozpoznawanie emocji w sekwencji wideo w czasie rzeczywistym z zastosowaniem sztucznej sieci neuronowej"* (Emotions recognition in real-time video sequences based on artificial neural network), Prof. **K. Zaremba** (supervisor).

[MSc37] Łukasz Nowak: *„Opracowanie koncepcji i realizacja układu odbiornika sekwencji impulsów UWB"* (Development of an I-UWB receiver intended for pulse sequence detection), Assist. Prof. **J. Kołakowski** (supervisor).

[MSc38] Michał Nowak: *„Wysokoprzepustowa sieć WLAN nowej generacji – projekt i analiza"* (High throughput next generation WLAN - project and analysis), Prof. **J. Wojciechowski** (supervisor).

[MSc39] Tomasz Olbrych: *„Model mikrofalowego tranzystora mocy GaN HEMT"* (Model of microwave GaN high electron mobility power transistor), Assist. Prof. **D. Gryglewski** (supervisor), (M.Sc. degree with honours).

[MSc40] Małgorzata Olszewska: *„Badanie możliwości optycznych systemu do rozpoznawania naczyń krwionośnych"* (The system for the detection of blood vessels on the optical path), Assist. Prof. **G. Domański** (supervisor).

[MSc41] Mikołaj Olszewski: *"Analiza możliwości wykorzystania standardu ZigBee do transmisji danych multimedialnych"* (Analysis of the possibilities of using the ZigBee standard for the transmission of multimedia data with low bit rates), Senior Lecturer **T. Keller** (supervisor).

[MSc42] Jarosław Orzeł: *"AFI-VFA: implementacja metody szybkiej relaksometrii NMR T_1 w środowisku Bruker ParaVision"* (AFI-VFA: an impelentation of a fast T_1 NMR relaxometry method in the Bruker ParaVision environment), Prof. **P. Bogorodzki** (supervisor), (M.Sc. degree with honours).

[MSc43] Krzysztof Ostrowski: *"Klasyfikacja ludzkich czynności w sekwencji 3d z użyciem probabilistycznych modeli graficznych"* (Human activities classification in sequences of joints positions using probablistic graphical models), Assist. Prof. **K. Ignasiak** (supervisor).

[MSc44] Przemysław Piasecki: *„Opracowanie stanowiska pomiarowego do badania właściwości materiałów dielektrycznych w zakresie fal mm i sub-mm"* (Developing measurement setup for testing dielectric materials properties in the mm and sub - mm waves), Assist. Prof. **G. Domański** (supervisor), (M.Sc. degree with honours).

[MSc45] Radosław Pietkiewicz: *„Badanie wybranych deskryptorów wizualnych w opracowanym systemie CBIR na przykładzie przeszukiwania wyników badań CT głowy"* (Analysis of selected visual descriptors performance in the designed CIBR system using exemplary CT head scans), Prof. **A. Przelaskowski** (supervisor).

[MSc46] Piotr Radaj: *"Tympanometria wieloczęstotliwościowa"* (Multi-frequency tympanometry), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[MSc47] Elżbieta Rdzanek: *"Opracowanie portalu do wymiany informacji medycznych"* (Development of a portal for the exchange of medical information), Assist. Prof. **M. Baszun** (supervisor).

[MSc48] Jakub Sitnicki: *„Przenośny monitor pacjenta oparty na systemie operacyjnym GNU/Linux"* (Portable patient monitor based on GNU/Linux operating system), Assist. Prof. **R. Kurjata** (supervisor).

[MSc49] Maciej Słodczyk: *"Stanowisko do badań urządzeń radiowych z funkcją adaptacji do stanu środowiska radiowego"* (Setup for adaptive radio equipment measurements), Reader **J. Cichocki** (supervisor).

[MSc50] Kamil Sorokosz: *„Zabezpieczenie sekwencji H.264 z wykorzystaniem steganografii dwupoziomowej w nośniku wideo"* (Two-level steganography as a solution for securing the H.264 video stream), Assist. Prof. **A. Buchowicz** (supervisor).

[MSc51] Filip Skibiński: *"Analiza obrazów biomedycznych w układzie mikroskopu polaryzacyjnego"* (Biomedical images analysis in the polarizing microscope system), Assist. Prof. **P. Garbat** (supervisor).

[MSc52] Jolanta Aurelia Szałkowska: *„Klasyfikacja sygnałów elektromiograficznych z wykorzystaniem analizy EMD"* (Electromyographic signal classification using Empirical Mode Decomposition), Assist. Prof. **K. Snopek** (supervisor).

[MSc53] Wojciech Szelągowski: *„Generacja sygnałów łącza radiowego systemu LTE z wykorzystaniem układów FPGA"* (LTE radio link signal generation with the use of FPGA), Reader **J. Cichocki** (supervisor), (M.Sc. degree with honours).

[MSc54] Kamil Szwaba: *"Ocena ilościowa ekstrakcji frakcji tlenu w mięśniu sercowym na podstawie obrazów MRI" (*Quantification of oxygen extraction fraction in myocardium

based on MRI images), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[MSc55] Piotr Tamilla: *"Wykorzystanie sieci WLAN do określenia pozycji geograficznej"* (Using WLAN to determine geographical position), Assist. Prof. **K. Radecki** (supervisor).

[MSc56] Daniel Trofimiuk: *„Narzędzia przechwytywania obrazu i dźwięku w środowiskach Windows i Linux"* (Video and audio capture tools in Windows and Linux operating systems), Assist. Prof. **G. Galiński** (supervisor).

[MSc57] Jakub Wagner: *"Algorytmy wzorcowania spektrofotometrycznego analizatora mieszanin olejów jadalnych, oparte na rozkładzie macierzy względem wartości szczególnych"* (Algorithms for calibration of spectrophotometric analser of edible oils mixtures, based on the singular value decomposition of matrices), Prof. **R. Z. Morawski** (supervisor).

[MSc58] Elżbieta Waśniewska: *"Pomiary zespolonej przenikalności elektrycznej wodnych roztworów $MgSO_4$, $ZnSO_4$, NH_4Cl_2 w pasmie częstotliwości mikrofalowych"* (Complex permittivity measurements of aqueous $MgSO_4$, $ZnSO_4$, NH_4Cl_2 solutions at microwave frequencies), Prof. **J. Krupka** (supervisor).

[MSc59] Joanna Wilczewska (Janucik): *„Metody detekcji guzów w mammogramach"* (Method of tumor detection in mammography), Prof. **A. Przelaskowski** (supervisor).

[MSc60] Maria Witkowska: *"Porównanie metod klasyfikacji w zadaniach identyfikacji cząstek w eksperymentach fizyki wysokich energii"* (Comparison of classification methods for a particle identification in the high energy physics experiments), Prof. **K. Zaremba** (supervisor).

[MSc61] Jan Zapał: *"Gait Metrics – narzędzie przetwarzania obrazu do analizy chodu"* (Gait Metrics – image processing software tool gait analysis), Assist. Prof. **Z. Wawrzyniak** (supervisor).

[MSc62] Jakub Żurkowski: *"Poprawa zasięgu łącza radiowego zestawu Amimon Panda AMN15020/16020"* (Radio link range enhancement of Amimon Panda AMN 15020/16020 kit), Assist. Prof. **D. Gryglewski** (supervisor), (M.Sc. degree with honours).

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

[MSc63] Krzysztof Jacek Godlewski: *„Wielousługowa sieć teleinformatyczna o zasięgu krajowym oparta na technice MPLS"* (Multiservice nationwide, MPLS-based telecommunication network), Reader **S. Kula** (supervisor).

[MSc64] Andrzej Krawczyk (co-author: Mateusz Woźniak): *"Rozproszony system pomiarowy wybranych parametrów sieci komórkowych"* (Distributed measurement system of chosen cellular networks parameters), Assist. Prof. **K. Ignasiak** (supervisor).

[MSc65] Wiesław Oleksa: *"Kompleksowe zabezpieczenie ośrodka przetwarzania informacji przed zaburzeniami elektromagnetycznymi"* (Comprehensive protection information processing centre against electromagnetic disturbance), Assist. Prof. **M. Laskowski** (supervisor).

[MSc66] Grzegorz Przybysz: *"Analiza działania I projekt horyzontowej linii radiowej z uwzględnieniem wymagań EMC"* (Analysis and design of radio horizon line, taking into account the requirements of the EMC), Assist. Prof. **M. Laskowski** (supervisor).

[MSc67] Piotr Radaj: *„Tympanometria wieloczęstotliwościowa"* (Multi-frequency tympanometry), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[MSc68] Krzysztof Wojtasiewicz: *"Metody pomiaru I project stanowiska pomiarowego do badań emisji niepożądanej generowanej przez urządzenia radiokomunikacyjne"* (Method of measurement and project of test site for testing unwanted emissions generated by radiocommunication devices), Assist. Prof. **M. Laskowski** (supervisor).

[MSc69] Mateusz Woźniak (co-author: Andrzej Krawczyk): *"Rozproszony system pomiarowy wybranych parametrów sieci komórkowych"* (Distributed measurement system of chosen cellular networks parameters), Assist. Prof. **K. Ignasiak** (supervisor).

5.5. B.Sc. Degrees

[BSc1] Marcin Banasik: *"Program do automatycznego wyznaczanie regionów zainteresowania"* (The program for the automatic determination of regions of interest), Assist. Prof. **P. Brzeski** (supervisor).

[BSc2] Edyta Barej: *"Urządzenie laboratoryjne do pomiarów sygnałów biologicznych"* (Laboratory device for measuring biological signals), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[BSc3] Adam Bartosik: *„Przeciwsobny wzmacniacz mocy klasy AB na pasmo 26 – 29 MHz"* (Class-AB push-pull power amplifier for frequency band of 26 MHz to 29 MHz), Assist. Prof. **J. Modzelewski** (supervisor).

[BSc4] Rafał Bednarczyk: *„Projekt i implementacja cyfrowego programowego syntezatora dźwiękowego realizującego wybrane metody syntezy"* (Project and implementation of software audio synthesizer implementing selected methods of synthesis), Senior Lecturer **P. Bobiński** (supervisor), Warsaw University of Technology Distant Learning Center (Ośrodek Kształcenia na Odległość PW).

[BSc5] Joanna Beling: *„Dwukanałowy system do pomiaru sygnału EEG”* (Dual-channel EEG measurement system), Prof. **A. Grzanka** (supervisor).

[BSc6] Magdalena Berezowska: *“Oprogramowanie wspomagające monitorowanie widma emisji radiowych z wykorzystaniem analizatora FS300”* (Radio emission monitoring software for R&S FS300 spectrum analyzer), Reader **J. Cichocki** (supervisor).

[BSc7] Krzysztof Jacek Borkowski: *„Opracowanie układu radiowej transmisji sygnałów wyzwalania i synchronizacji w ultraszerokopasmowych systemach lokalizacyjnych”* (The development of radio transmission system for triggering and synchronization in UWB localization systems), Assist. Prof. **J. Kołakowski** (supervisor).

[BSc8] Kamil Brzóski: *“Modulator fazy do układu modulacji amplitudy metodą fazową”* (Phase modulator for the amplitude modulator using ampliphase method), Assist. Prof. **J. Modzelewski** (supervisor).

[BSc9] Joanna Ceglińska: *„Rejestrator aktywności ruchowej pacjenta z wykorzystaniem telefonu komórkowego”* (Patient's physical activity recorder using a mobile phone), Assist. Prof. **R. Kurjata** (supervisor).

[BSc10] Piotr Chmiel: *„Program do analizy skuteczności gry siatkarzy”* (Software analyzing effectiveness of volleyball players), Prof. **W. Winiecki** (supervisor).

[BSc11] Łukasz Cieśla: *“Interaktywny system kolokwiów”* (Interactive tests system), Assist. Prof. **K. Ignasiak** (supervisor).

[BSc12] Bartosz Dąbrowski: *„Projekt i realizacja systemu cyfrowych efektów gitarowych na procesorze SHARC”* (Project and realization of digital guitar effects system on SHARC processor), Senior Lecturer **P. Bobiński** (supervisor).

[BSc13] Vitomir Djaja-Jośko: *„Opracowanie sterowanego tłumika sygnałów ultraszerokopasmowych”* (Development of digitally controlled attenuator for UWB signals), Assist. Prof. **J. Kołakowski** (supervisor).

[BSc14] Łukasz Dobrzeniecki: *“Projekt domowego studia dźwiękowego i jego zastosowanie do edycji dźwięku”* (The project of home recording sound studio and its audio editing application), Prof. **Z. Kulka** (supervisor).

[BSc15] Natalia Dołgoszyja: *„Detekcja sygnału w obrazowaniu nanocząsteczek magnetycznych”* (Signal detection in magnetic particle imaging), Assist. Prof. **W. Smolik** (supervisor).

[BSc16] Adam Dunajewski: *„Symmetrical Gait Models”* (Symetryczne modele chodu), Assist. Prof. **J. Dusza** (supervisor).

[BSc17] Katarzyna Dyga: *“Detektor do pomiaru zespolonego współczynnika odbicia na pasmo ISM 2.4 - 2.5 GHZ”* (Detecor for measurement of complex reflection coeficcient in ISM 2.4 - 2.5 GHz band), Prof. **W. Gwarek** (supervisor).

[BSc18] Kamil Aleksander Dzieżyk: *“Generator Przebiegów EKG”* (ECG waveform generator), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[BSc19] Jacek Gasztold: *“Projekt i realizacja konwertera protokołów M-Bus / ZigBee”* (The design and realization of M-Bus / ZigBee protocol converter), Prof. **W. Winiecki** (supervisor).

[BSc20] Krzysztof Gomulski: *“Metody analizy parametrów przebiegu awarii w reaktorze”* (Methods for analysis of nuclear reactor malfunctions), Prof. **K. Zaremba** (supervisor).

[BSc21] Marcin Góralczyk: *„Charakteryzacja małosygnałowa tranzystora AlGaN/GaN HEMT w pasmie L i S”* (Small signal modeling of AlGaN/GaN HEMT transistor for L and S band), Assist. Prof. **W. Wojtasiak** (supervisor), (B.Sc. degree with honours).

[BSc22] Jarosław Iwaszkiewicz: *“Uniwersalny wzmacniacz sygnałów bioelektrycznych z łączem USB”* (Universal amplifier with USB connection for measuring bioelectricals signals), Assist. Prof. **K. Derzakowski** (supervisor)

[BSc23] Wojciech Jakubowski: *“Model referencyjny elementów nadajnika radia cyfrowego w standardzie DRM”* (Reference model of elements of the DRM digital radio transmitter), Assist. Prof. **K. Kurek** (supervisor).

[BSc24] Maya Anna Jastrzębowska: *„Analiza relacji między obrazami strukturalnymi istoty szarej pochodzącymi z rezonansu magnetycznego a wynikami testów klinicznych stosowanych do diagnozy choroby Alzheimera”* (Analysis of the relationship between structural magnetic resonance images of grey matter and results of clinical tests used in the diagnosis of Alzheimer disease), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[BSc25] Joanna Jendraszek: *“Pomiar ilości mleka w piersi kobiety karmiącej”* (Measurement of amount of milk in mother’s breast), Assist. Prof. **G. Domański** (supervisor).

[BSc26] Adrian Marek Józefiak: *„Design of the LTE network coverage in the public use building”*, Assist. Prof. **S. Kozłowski** (supervisor), studies in English.

[BSc27] Tomasz Michał Karpisz: *„Analiza elektromagnetyczna własności dyspersyjnych mikrostrukturalnych włókien światłowodowych”* (Electromagnetic modeling of modal properties of photonic crystal fibers), Assist. Prof. **B. Salski** (supervisor).

[BSc28] Adam Kiczor: *„Projekt rezonatora do zastosowań rezonansu protonowo –*

elektronowego (PEDRI)" (Project of resonator to proton – electron double resonance imaging (PEDRI), Prof. **P. Bogorodzki** (supervisor).

[BSc29] Joanna Korwek: *"Instrukcje Laboratoryjne - Podstawy obrazowania techniką rezonansu magnetycznego z wykorzystaniem tomografu MRI G-Scan"* (Laboratory instructions – basics of magnetic resonance imaging by means of G-scan tomograph), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[BSc30] Mateusz Korzeniowski: *„Transmisja danych przy użyciu światła widzialnego z zastosowaniem lampy fluorescencyjnej"* (Visible light communication with the use of fluorescent lamp), Assist. Prof. **K. Radecki** (supervisor).

[BSc31] Paweł Kosek: *"Monitor ruchu oddechowego"* (Respiration monitor), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[BSc32] Piotr Kosior: *„Interfejs użytkownika dla Transmission Line Solver przy wykorzystaniu interfejsu Metro UI"* (User Interface for Transmission Line Solver using Metro UI), Assist. Prof. **P. Miazga** (supervisor), studies in English.

[BSc33] Katarzyna Kostro: *„Detekcja nanocząsteczek superparamagnetycznych"* (The detection of super-paramagnetic nanoparticles), Assist. Prof. **W. Smolik** (supervisor).

[BSc34] Magdalena Król: *"Projekt i realizacja syntezatora w technologii VSTi"* (Design and realization of the VSTi synthesizer), Senior Lecturer **P. Bobiński** (supervisor).

[BSc35] Mateusz Marek Krysicki: *„Konwersja geometrii niekartezjańskiej ze zdjęć, pomiarów i obrazów laserowych do symulacji elektromagnetycznych"* (Conversion of non-Cartesian geometry from photos, measurements and laser images to electromagnetic simulation), Assist. Prof. **M. Celuch** (supervisor).

[BSc36] Damian Krystkiewicz: *"Symulator skanera magnetycznego rezonansu jądrowego"* (Nuclear magnetic resonance scanner simulator), Prof. **P. Bogorodzki** (supervisor).

[BSc37] Dawid Kuchta: *"Projekt i realizacja 4-bitowego przesuwnika fazy na pasmo 0.9-1.1 GHz"* (Design and performance of a 0.9-1.1 GHz 4-bit, compact phase-shifter), Assist. Prof. **D. Gryglewski** (supervisor).

[BSc38] Artur Lewandowski: *"Realizacja bezprzewodowego kontrolera MIDI do zastosowań studyjnych"* (The implementation of a wireless MIDI controller for studio), Prof. **Z. Kulka** (supervisor).

[BSc39] Natalia Liberacka: *„Budowa lampowego wzmacniacza akustycznego"* (Construction of tube amplifier), Senior Lecturer **P. Bobiński** (supervisor).

[BSc40] Piotr Lisiowski: *"Implementacja algorytmów wyznaczania deskryptorów MPEG-7 w technologii Nvidia CUDA"* (Implementation of MPEG-7 Descriptors using Nvidia CUDA architecture), Assist. Prof. **G. Galiński** (supervisor).

[BSc41] Piotr Łuba: *"Projekt systemu internetowego do przechowywania i udostępniania danych geotechnicznych"* (Design web-based system for storing and sharing geotechnical data), Assist. Prof. **P. Bilski** (supervisor).

[BSc42] Agata Łuczyńska: *"Modelowanie kinematyki chodu prawidłowego i patologicznego człowieka w środowisku OpenSim"* (Modeling normal and pathological gait kinematics in OpenSim), Assist. Prof. **M. Kwacz** (supervisor).

[BSc43] Michał Mach: *"Oprogramowanie do renderowania wolumetrycznego obrazów medycznych z plików w standardzie DICOM"* (Volumetric rendering of medical data acquired from DICOM standard files), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[BSc44] Michał Mainka: *"Inteligentny czujnik z interfejsem ZigBee"* (Intelligent sensor with Zigbee interface), Prof. **W. Winiecki** (supervisor).

[BSc45] Rafał Majewski: *"Project i budowa cewki typu Low-Pass Birdcage"* (Designing and building a Low-Pass Birdcage coil), Prof. **P. Bogorodzki** (supervisor).

[BSc46] Jacek Malczyk: *"Zastosowanie algorytmu TPS-RPM - znajdowania korespondencji oraz transformacji w analizie znakowanych obrazów rezonansu magnetycznego serca"* (Finding correspondence and transformation for two point sets collected from Cardiac Tagged Magnetic Resonance Imaging using TPS-RPM algorithm), Prof. **P. Bogorodzki** (supervisor).

[BSc47] Krzysztof Malej: *"Symulator implantowany FES"* (Microprocessor - controlled FES device), Prof. **R. Paśniczek** (supervisor).

[BSc48] Małgorzata Maria Mazur: *"Symulacja toru transmisji danych z modulacją FSK/PSK w środowisku LabVIEW"* (Simulation of data transmission with FSK/PSK modulation in LabVIEW), Assist. Prof. **K. Radecki** (supervisor).

[BSc49] Wojciech Mazurek: *"Implementacja algorytmów zmiany rozdzielczości obrazów w technologii NVIDIA CUDA"* (Implementation of image scaling algorithms using NVIDIA CUDA architecture), Assist. Prof. **G. Galiński** (supervisor).

[BSc50] Maciej Michalski: *"System powiadamiania alarmowego na oddziale intensywnej terapii medycznej"* (Alarm notification system on intensive medical therapy), Assist. Prof. **R. Kurjata** (supervisor).

[BSc51] Mateusz Miklewski: *"Serwis internetowy do wyznaczania właściwości białek i peptydów na potrzeby badań proteomicznych"* (Website offering services for determining the properties of proteins and peptides for proteomic studies), Assist. Prof. **T. Rubel** (supervisor).

[BSc52] Krzysztof Mileszczyk: *"Rezonansowy wzmacniacz mocy klasy DE do laboratorium studenckiego"* (High-frequency class - DE tuned power amplifier for students' lab), Assist. Prof. **J. Modzelewski** (supervisor).

[BSc53] Wojciech Minda: *"Automatyczny detektor do pomiaru natężenia promieniowania źródeł przemysłowych"* (Automatic detector measuring radiation intensity of industrial sources), Prof. **K. Zaremba** (supervisor).

[BSc54] Maciej Murawski (co-author: Konrad Stanik): *„Detektor miejsca upadku"* (Fall location system), Assist. Prof. **K. Ignasiak** (supervisor).

[BSc55] Bartłomiej Myszyński: *"Czujnik pola magnetycznego Ziemi dla określania orientacji obiektów na płaszczyźnie XY"* (Earth's magnetic field sensor for determining the orientation of objects on the plane XY), Assist. Prof. **P. Kopyt** (supervisor).

[BSc56] Konrad Neneman: *„Monitorowanie chodu pacjenta na podstawie pomiarów akcelerometrycznych"* (Gait monitoring system based on a measurement of acceleration), Assist. **A. Łuczyk** (supervisor).

[BSc57] Magdalena Oknińska: *"Traktografia istoty białej w mózgu - Fiber-tracking"* (Fiber-tracking), Prof. **P. Bogorodzki** (supervisor).

[BSc58] Ewa Oponowicz: *„Metody Monte Carlo w projektowaniu elementów układów formatowania wiązek terapeutycznych medycznych akceleratorów elektronów"* (The Monte Carlo methods in designing elements of therapeutic beam forming systems in medical electron accelerators), Prof. **K. Zaremba** (supervisor).

[BSc59] Paweł Orzechowski: *„Magnetometria NMR z falą ciągłą – badanie układu detekcyjnego"* (NMR magnetometry with continuous wave - study of the the detection system), Prof. **P. Bogorodzki** (supervisor).

[BSc60] Przemysław Arkadiusz Osial: *"Wzmacniacz LNA na pasmo 5-6GHz"* (LNA amplifier at 5-6 GHz band), Assist. Prof. **D. Gryglewski** (supervisor).

[BSc61] Patryk Panter: *"Szablon oprogramowania FPGA dla środowiska LabVIEW i platformy CompactRIO"* (FPGA software template for LabVIEW environment and CompactRIO platform), Assist. Prof. **R. Łukaszewski** (supervisor).

[BSc62] Piotr Pawłowski: *"Mobilny przewodnik turystyczny"* (The mobile tourist guide), Assist. Prof. **K. Ignasiak** (supervisor).

[BSc63] Ewa Katarzyna Ramus: *„Sygnalizator zbliżających się pojazdów uprzywilejowanych dla osób niedosłyszących"* (System of warning against aproching emergency vehicles), Assist. Prof. **W. Zabołotny** (supervisor).

[BSc64] Adam Piotr Raniszewski: *„Antena łatowa na wolne pasma ISM 2.45 i 5.8 GHz"* (Dual-feed circularly-polarized microstrip antenna for 2.45 and 5.8 GHz), Prof. **W. Gwarek** (supervisor).

[BSc65] Mateusz Rasiński: *"System katalogowania danych obrazowych"* (Image date archiving system), Assist. Prof. **B. Sawionek** (supervisor).

[BSc66] Michał Ratuszny: *"Aplikacja bazodanowa klienta - serwer do rekonfiguracji mierników hałasu i drgań"* (Client - server database application for reconfiguration of vibration and noise measures), Assist. Prof. **A. Podgórski** (supervisor).

[BSc67] Elżbieta Rdzanek: *"Opracowanie portalu do wymiany informacji medycznych"* (Development of a portal for the exchange of medical information), Assist. Prof. **M. Baszun** (supervisor).

[BSc68] Łukasz Rosiński: *„Analiza klucza diodowego pod kątem optymalizacji sygnałowego toru tomografu pojemnościowego ET3"* (Diode switch analysis in accordance to tomograph ET3 signal route optimisation), Senior Lecturer **T. Olszewski** (supervisor).

[BSc69] Mateusz Rosłanowski: *"Sterowniki do wybranych przyrządów pomiarowych do współpracy z produktami firmy Apple"* (Drivers for selected measuring instruments for cooperation with Apple products), Assist. Prof. **A. Podgórski** (supervisor).

[BSc70] Robert Rozmus: *"Rozbudowa oprogramowania do symulacji biomechaniki odcinka szyjnego kręgosłupa człowieka"* (The development of human development of human cervical spine biomechanical simulation software), Assist. Prof. **M. Kwacz** (supervisor).

[BSc71] Paweł Rudziński: *„Mikroprocesorowe urządzenie do magnetostymulacji"* (Microprocessor magnetostimulation device), Assist. Prof. **G. Domański** (supervisor).

[BSc72] Kamil Sażyński: *„Projekt anteny do systemu RFID, pracującej w zakresie UHF (860MHz - 960MHz)"* (Design of antenna for RFID system operating in the UHF band (860 MHz - 960MHz), Assist. Prof. **P. Kopyt** (supervisor).

[BSc73] Piotr Siemdaj: *"Źródło sygnału 4-QAM i 16-QAM w środowisku LabVIEW"* (4-QAM and

16-QAM signal source in LabVIEW), Senior Lecturer **H. Chaciński** (supervisor).

[BSc74] Wiktor Jan Sienkiewicz: *"Mobilna aplikacja do akwizycji i przetwarzania danych z systemu monitorowania chodu pacjenta"* (Mobile application for collecting and analysing data from patient's gait monitoring system), Assist. **A. Łuczyk** (supervisor).

[BSc75] Konrad Stanik (co-author: Maciej Murawski): *„Detektor miejsca upadku"* (Fall Location System), Assist. Prof. **K. Ignasiak** (supervisor).

[BSc76] Magdalena Stanowska: *"Zastosowanie procedur optymalizacji do wzorcowania analizatora spektrofotometrycznego"* (Application of optimisation procedures for calibration of spectrophotometric analyser), Assist. Prof. **A. Miękina** (supervisor).

[BSc77] Piotr Steczeń: *"Symulacja spektrometrycznego przetwornika analogowo-cyfrowego"* (Analog to digital spectrometric converter modeling), Assist. Prof. **B. Konarzewski** (supervisor).

[BSc78] Michał Swat: *"Elektromagnetyczne modelowanie i optymalizacja ekranów typu Salisbury"* (Electromagnetic modeling and optimization of Salisbury screens), Assist. Prof. **M. Celuch** (supervisor).

[BSc79] Piotr Synal: *„Adaptacja akustyczna studia domowego"* (Acoustic adaptation of the home studio), Prof. **Z. Kulka** (supervisor).

[BSc80] Maciej Szczepankowski: *„Laboratoryjne stanowisko pomiarowe LabView do eksperymentów PEDRI"* (Laboratory measuring LabView device for PERI experiments), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[BSc81] Kamil Szewczyk: *"Projekt i realizacja przemysłowego telefonu komórkowego przeznaczonego dla osób starszych"* (Design and realization of the mobile phone for elderly people), Assist. Prof. **T. Buczkowski** (supervisor).

[BSc82] Katarzyna Szopińska: *"Budowa i badanie zastosowania modułu UHF-RFID do rozpoznawania codziennych aktywności"* (Design and investigation of an UHF-RFID module for ADL recognition), Assist. Prof. **R. Kurjata** (supervisor).

[BSc83] Karol Szymczyk: *„System do pomiaru parametrów oddechowych pacjenta"* (System for the breathing parameters measurement), Prof. **J. Marzec** (supervisor).

[BSc84] Marcin Śpiewak: *„Sonda dla trójwymiarowej tomografii pojemnościowej"* (Three - dimensional electrical capacitance tomography probe), Assist. Prof. **W. Smolik** (supervisor).

[BSc85] Maciej Tenderenda: *„Elektroniczny stetoskop z kartą dźwiękową"* (Electronic stethoscope with a sound card), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[BSc86] Wojciech Toczyłowski: *"Opracowanie układu sterowanej mikroprocesorowo linii opóźniającej"* (Development of a microprocessor-controlled delay line), Assist. Prof. **J. Kołakowski** (supervisor).

[BSc87] Paweł Tor (co-author: Michał Wieteska): *"Modyfikacja i rozbudowa układu do hiperpolaryzacji gazów szlachetnych metodą optycznego pompowania z wymianą spinu"* (Modification and development of SEOP hyperpolarisation system), Prof. **P. Bogorodzki** (supervisor).

[BSc88] Dawid Trojan: *"4-elementowy liniowy szyk antenowy na pasmo 5 GHz zasilany synfazowo"* (4 element linear phased array for 5 GHz band with equiphased feed), Prof. **Y. Yashchyshyn** (supervisor).

[BSc89] Tomasz Truszczyński: *„A quadrature frequency converter in a feedback loop of high frequency cavities in the Proton Synchrotron at CERN"* (Kwadraturowy konwerter częstotliwości w pętli sprzężenia zwrotnego rezonatorów Synchrotronu Protonowego w CERN), Assist. Prof. **K. Kurek** (supervisor).

[BSc90] Rafał Trzciński: *"Wirtualny przyrząd pomiarowy na platformę Android: Multimetr HP 34401A"* (Virtual measuring device on Android platform: Multimeter HP 34401A), Assist. Prof. **R. Łukaszewski** (supervisor).

[BSc91] Agata Tyśnicka: *„Przeglądarka obrazów zgodna z formatem aplikacji MPEG Photo – Player"* (Image viewer application according to Standard MPEG - A Photo Player), Assist. Prof. **G. Galiński** (supervisor).

[BSc92] Ajakumbi Baba Usman: *„WLAN throughput analysis in presence of Bluetooth interference"*, Senior Lecturer **T. Keller** (supervisor), studies in English.

[BSc93] Marcin Wachowicz: *„Wzmacniacz klasy E na pasmo CB o mocy wyjściowej 15W"* (Class E amplifier for CB band with output power 15W), Assist. Prof. **J. Modzelewski** (supervisor).

[BSc94] Mateusz Waldek: *"Liniowy wzmacniacz rezonansowy klasy AB o mocy maksymalnej 20W i paśmie 26-29MHz"* (Class AB 20W linear resonant amplifier for the 26-29MHz band), Assist. Prof. **J. Modzelewski** (supervisor).

[BSc95] Maciej Wardziak: *"Odbiornik emisji DRM z kwadraturową przemianą częstotliwości"* (DRM receiver with a quadrature frequency conversion), Assist. Prof. **W. Kazubski** (supervisor).

[BSc96] Wojciech Węclewski: *"Doświadczalny rezonansowy wzmacniacz klasy E do diatermii krótkofalowej"* (Experimental resonant class E amplifier for shortwave

diathermy), Assist. Prof. **J. Modzelewski** (supervisor).

[BSc97] Karol Piotr Wierzbiński: *„Generator diagramów dyspersyjnych dla kryształów fotonicznych”* (Photonic bandgap diagram generator for photonic crystals), Assist. Prof. **B. Salski** (supervisor).

[BSc98] Michał Wieteska (co-author: Paweł Tor): *“Modyfikacja i rozbudowa układu do hiperpolaryzacji gazów szlachetnych metodą optycznego pompowania z wymianą spinu”* (Modification and development of SEOP hyperpolarisation system), Prof. **P. Bogorodzki** (supervisor).

[BSc99] Łukasz Więch: *“System do rekomendowania filmów na podstawie opisów tekstowych”* (System for recommending films regarding textual descriptions), Assist. Prof. **G. Galiński** (supervisor).

[BSc100] Kamila Witecka: *“Zastosowanie sztucznych sieci neuronowych do identyfikacji białek w eksperymentach proteomicznych”* (Application of the artifical neural networks to the identification of proteins in proteomic research), Assist. Prof. **T. Rubel** (supervisor), (B.Sc. degree with honours).

[BSc101] Augustyn Wójcik: *“Projekt i budowa tranzystorowego wzmacniacza akustycznego”* (Project and implementation of transistor acoustic amplifier), Senior Lecturer **P. Bobiński** (supervisor).

[BSc102] Magdalena Wójtowicz: *“Rejestrator tempeatury dla osób obłożnie chorych”* (Temperature logger for severely diseased patients), Assist. Prof. **W. Zabołotny** (supervisor).

[BSc103] Bartosz Zalewski: *“Model i symulacja wirtualnego przyrządu pomiarowego”* (Model and simulation of virtual instrument), Assist. Prof. **R. Łukaszewski** (supervisor).

[BSc104] Katarzyna Zdulska: *“Projekt i wykonanie czytnika RFID pracującego na częstotliwości 900 MHz”* (900 MHz frequency band RFID reader design and implementation), Assist. Prof. **P. Kopyt** (supervisor), (B.Sc. degree with honours).

[BSc105] Mateusz Ziemek: *“System automatycznego monitoringu ulicy”* (Automatic street monitoring system), Assist. Prof. **J. Naruniec** (supervisor).

[BSc106] Szymon Zwolan: *“Monitor ruchu palców w funkcjonalnym rezonansie magnetycznym”* (A wireless fMRI device for finger motion monitoring), Assist. Prof. **B. Sawionek** (supervisor).

[BSc106a] Katarzyna Odelga: *“Oprogramowanie do spektrofotometrycznej analizy mieszanin octów spożywczych”* (Software for spectrophotometric analysis of mixtures of vinegars), Prof. **R. Z. Morawski** (supervisor), graduated from the Institute of Metrology and Biomedical Engineering, Faculty of Mechatronics.

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

[BSc107] Michał Dubaj: *“Światłowodowe telefoniczne łącze optyczne”* (Optical-fiber telephone optical link), Assist. Prof. **L. Lewandowski** (supervisor).

[BSc108] Michał Smater: *“Wykonanie, optymalizacja i porównanie programów testowych FDTD-3D dla GPU z wykorzystaniem OpenCL i CUDA w środowisku Qt”* (Implementation, optimization and comparison testing FDTD-3D programs for the GPU OpenCL and CUDA using the Qt environment), Assist. Prof. **M. Sypniewski** (supervisor).

[BSc109] Wojciech Żelazko: *“Projekt i implementacja modulatora i demodulatora OFDM na mikrokontrolerze ATMEGA”* (OFDM modulator and demodulator: project and implementation using simple general purpose microcontroller), Assist. Prof. **M. Bury** (supervisor).

6. PUBLICATIONS

6.1. Scientific and technical books, chapters in books

[Pub1] A. Bilski: “Diagnostics of Complex Analog Systems with Parametric Faults using Support Vector Machines”, in: T. Kwater, B. Twaróg (Eds.), *Computing in Science and Technology, Monographs in Applied Informatics* (2013), *Wyd. Uniwersytetu Rzeszowskiego*, section 1, ISBN 978-83-7338-895-6, pp. 7-24.

[Pub2] P. Bilski: „Artifical Intelligence Methods in the Diagnostics of Analog Systems”, O*ficyna Wydawnicza PW* (2013), ISBN 978-83-7814-159-4, 178 pp.

[Pub3] Z. Kulka: “PCM Versus SDM Audio Converters”, in: J. A. Adamczyk (Ed.), *Signal Processing in Sound Engineering, Collection of Acoustics and Ultrasound* (2013), *Wyd. Instytutu Podstawowych Problemów Techniki PAN*, ISBN 978-83-89687-84-5, pp. 77-90.

[Pub4] M. Mahboob, J. Żera: “Efficiency of Automatic Online Music Recognition on the Internet”, in: J. A. Adamczyk (Ed.), *Signal Processing in Sound Engineering, Collection of Acoustics and Ultrasound* (2013), *Wyd. Instytutu Podstawowych Problemów Techniki PAN*, ISBN 978-83-89687-84-5, pp. 167-173.

[Pub5] W. T. Smolik: „Rekonstrukcja obrazów w elektrycznej tomografii pojemnościowej” (Reconstruction of the Images in Electrical Capacitance Tomography), O*ficyna Wydawnicza PW* (2013), ISBN 978-83-7814-097-9, 226 pp.

[Pub6] K. M. Snopek: „Studies on Complex and Hypercomplex Multidimensional Analytic Signals”, O*ficyna Wydawnicza PW* (2013), ISBN 978-83-7814-143-3, 169 pp.

[Pub7] J. Wojciechowski, K. Pieńkosz: „Grafy i sieci” (Graphs and Networks), *Wydawnictwo Naukowe PWN* (2013), ISBN 978-83-01-17436-1, 440 pp.

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.

[Pub8] K. Abe (...), M. Dziewiecki, R. Kurjata, J. Marzec, K. Zaremba, M. Ziembicki (346 external authors): „T2K Neutrino Flux Prediction”, *Physical Review D*, vol. 87 (2013), pp. 012001-1-012001-4.

[Pub9] K. Abe (...), M. Dziewiecki, R. Kurjata, J. Marzec, P. Płoński, K. Zaremba, M. Ziembicki (349 external authors): „Measurement of the Inclusive ν_μ Charged Current Cross Section on Carbon in the Near Detector of the T2K Experiment”, *Physics Letters D*, vol. 87 (2013), pp. 092-003-1-092003-20.

[Pub10] K. Abe (...), M. Dziewiecki, R. Kurjata, J. Marzec, P. Płoński, K. Zaremba, M. Ziembicki (337 external authors): „Measurement of Neutrino Oscillation Parameters from Muon Neutrino Disappearance with an Off-Axis Beam”, *Physical Review Letters* (2013), pp.211803-1-211803-7.

[Pub11] K. Abe (...), M. Dziewiecki, R. Kurjata, J. Marzec, P. Płoński, K. Zaremba, M. Ziembicki (251 external authors): „Evidence of Electron Neutrino Appearance in a Muon Neutrino Beam”, *Physics Letters D*, vol. 88 (2013), pp. 032002-1-032002-42.

[Pub12] C. Adolph (…), M. Dziewiecki, J. Marzec, A. Padée, K. Zaremba, M. Ziembicki (216 external authors): „Leading and next-to-Leading Order Gluon Polarization in the Nucleon and Longitudinal Double Spin Asymmetries from Open Charm Muoproduction”, *Physics Letters D*, vol. 87 (2013), pp. 052018-1-052018-22.

[Pub13] C. Adolph (...), M. Dziewiecki, J. Marzec, K. Zaremba, M. Ziembicki (211 external authors): „Leading Order Determination of the Gluon Polarisation from DIS Events with High-p_T Hadron Pairs”, *Physics Letters B*, vol. 718 (2013), pp. 922-930.

[Pub14] C. Adolph (...), M. Dziewiecki, J. Marzec, K. Zaremba, M. Ziembicki (205 external authors): „Hadron Transverse Momentum Distributions in Muon Deep Inelastic Scattering at 160 GeV/*c*”, *The European Physical Journal C*, vol. 73 (2013),doi: 10.1140/epjc/s100052-013-2531-6, pp. 2531-2537.

[Pub15] C. Adolph (...), M. Dziewiecki, J. Marzec, A. Padée, K. Zaremba, M. Ziembicki (216 external authors): „D^* and D Meson Production in Muon Nucleon Interactions at 160 GeV/c”*, The European Physical Journal C*, vol. 72 (2012), doi: 10. 1140/ epjc/s10052-012-2253-1, pp. 1-17.

[Pub16] C. Adolph (...), M. Dziewiecki, R. Kurjata, J. Marzec, K. Zaremba, M. Ziembicki (202 external authors): „Study of Σ (1385) and Ξ (1321) Hyperon and Antihyperon Production in Deep Inelastic Muon Scattering”, *The European Physical Journal C*, vol. 73 (2013), doi: 10.1140/epjc/s 10052-013-2581-9, pp. 2581-2591.

[Pub17] C. Adolph (...), M. Dziewiecki, R. Kurjata, J. Marzec, K. Zaremba, M. Ziembicki (216 external authors): „Measurement of the Cross Section for High-p_T Hadron Production in the Scattering of 160-GeV/c Muons off Nucleons", *Physical Review D*, vol. 88 (2013), pp. 091101-1-091101-8.

[Pub18] M. Antonello (…), P. Płoński, R. Sulej, K. Zaremba (53 external authors): "Precise 3D Track Reconstruction Algorithm for the ICARUS T600 Liquid Argon Time Projection Chamber Detector", *Advances in High Energy Physics*, vol. 2013, doi: 10. 1155/2013 /260820, pp. 1-16.

[Pub19] M. Antonello (….), P. Płoński, R. Sulej, K. Zaremba (56 external authors): "Search for Anomalies in the ν_e Appearance from a ν_μ Beam", *European Physical Journal C*, vol. 73, issue 10 (2013), pp. 1-7.

[Pub20] M. Antonello (….), P. Płoński, R. Sulej, K. Zaremba (55 external authors): "Experimental Search for the "LSND Anomaly" with the ICARUS Detector in the CNGS Neutrino Beam", *European Physical Journal C*, vol. 73, issue 3 (2013), doi: 10.1140 /epjc/s10052-013-2345-6, pp. 1-8.

[Pub21] S. Aoki (...), M. Dziewiecki, R. Kurjata, J. Marzec, K. Zaremba, M. Ziembicki (62 external authors): „The T2K Side Muon Range Detector (SMRD)", *Nuclear Instruments and Methods in Physics Research A*, vol. 698 (2013), pp. 135-146.

[Pub22] J. Będkowski, J. Naruniec: „On-line Range Registration with GPGPU", *Opto-Electronics Review,* vol. 21, no .1 (2013), pp. 52-62.

[Pub23] P. Bilski: "Application of Clustering Method for the Ambiguity Groups Detection in the Diagnostic of Analog Systems", *Przegląd Elektrotechniczny*, vol. LXXXIX, no. 2a (2013), pp. 276-278 (from Dec. 2013 transferred to MSHE list B of journals).

[Pub24] P. Bilski, W. Winiecki: „Analysis of the Position-based Quantrum Cryptography Usage in the Distributed Measurement System", *Measurement*, vol. 46, issue 10 (2013), pp. 4353-4361.

[Pub25] A. Bilski, J. Wojciechowski: "Automated Parametric Fault Detection in Complex Analog Circuits Rusing SVM and PCA", *Metrology and Measurement Systems*, in print.

[Pub26] A. Buchowicz: "Video Coding and Transmission for 3D Television – a Survey", *Opto-Electronics Review,* vol. 21, no .1 (2013), pp. 39-51.

[Pub27] T. Buczkowski, D. Janusek, H. Zavala-Fernandez, M. Skrok, M. Kania, A. Liebert: „Influence of Mobile Phones on the Quality of ECG Signal Acquired by Medical Devices", *Measurement Science*, vol. 13, no. 5 (2013), doi: 10.2478/msr-2013-0035, pp.231-236.

[Pub28] N. Dvurechenskaya, P. R. Bajurko, R. J. Zieliński, Y. Yashchyshyn: „Measurements of Shielding Effectiveness of Textile Materials Containing Metal by the Free-Space Transmission Technique with Data Processing in Time Domain", *Metrology and Measurement Systems*, vol. 20, no. 2, (2013), pp. 217-228.

[Pub29] P. Garbat, W. Skarbek, M. Tomaszewski: „Structured Light Camera Calibration", *Opto-Electronics Review,* vol. 21, no. 1 (2013), doi: 10.2478-s117772-013-0076-8, pp. 23-38.

[Pub30] S. L. Hahn: „Possible Experimental Verification of Bellert's Cosmological Red Shift Law using the Cosmic Microwave Background Radiation", *Astrophysics and Space Science* (2013), doi: 10.1007/s1050 9 - 12-1260-x, pp. 11-39.

[Pub31] S. L. Hahn, K. M. Snopek: "Quasi-Analytic Multidimensional Signals", *Bulletin of the Polish Academy of Science,* in print.

[Pub32] A. Łysiuk, K. Godziszewski, Y. Yashchyshn J. Modelski: "Design and Investigation of Photonic Remote Antenna Units for Bidirectional Transmission in the Last Mile Wireless over Fiber System", *Radioengineering*, vol. 22, no. 4, (Dec. 2013), pp. 1239-1248.

[Pub33] M. Jakubowski, G. Pastuszak: „Block-based Motion Estimation Algorithms – a Survey", *Opto-Electronics Review*, vol. 21, no .1 (2013), doi: 10.2478/s11772-013-00 71-0, pp. 86-102.

[Pub34] J. Karczmarski, T. Rubel, M. Mikuła, J. Wolski, A. Rutkowski, E. Zagorowicz, M. Dadlez, J. Ostrowski: „Pre-analytical-related Variability Influencing Serum Peptide Profiles Demonstrated in a Mass Spe-ctrometry-based Search for Colorectal and Prostate Cancer Biomarkers", *Acta Biochimica Polonica*, vol. 60, no. 3 (2013), pp. 417-425.

[Pub35] K. S. Kulpa, P. Samczynski, M. Malanowski, A. Gromek, D. Gromek, W. Gwarek, B. Salski, G. Tanski: "An Advanced SAR Simulator of Three-Dimensional Structures Combining Geometrical Optics and Full-Wave Electromagnetic Methods", *IEEE Transactions on Geoscience and Remote Sensing*, no. 99, pp. 776-784.

[Pub36] A. Łysiuk, K. Godziszewski, Y. Yashchyshyn: "Low Cost E/O and O/E Modules for Radio over Fibre Link", *Microwave and Optical Technology Letters*, vol. 55, no. 10, (2013), doi: 10.1002/mop, pp. 2423-2425.

[Pub37] R. Korycki: "Time and Spectral Analysis Methods with Machine Learing for the Authentication of Digital Audio Recordings", *Forensic Science International*, vol. 230 (2013), pp. 117-126.

[Pub38] M. Mikołajewski: "A Self-oscillating H.F. Power Generator with a Class E Resonant Amplifier", *Bulletin of the Polish Academy of Sciences, Technical Sciences*, vol. 6,

no. 2 (2013), doi: 10.2478/bpasts-2013-0052, pp. 527-534.

[Pub39] R. Z. Morawski: "An Application-oriented Mathematical Meta-model of Measurement", *Measurement*, vol. 46 (2013), pp. 3753-3765.

[Pub40] G. Pastuszak, M. Jakubowski: „Adaptive Computationally Scalable Motion Estimation for the Hardware H.264/AVC Encoder", *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 23, no. 5 (2013), pp. 802-812.

[Pub41] A. Rudziński, A. Łysiuk, K. Godziszewski: "Compact Bandstop Filter for UHF in Modified Meander Arrangement with Capacitors", *Microwave and Optical Technology Letters*, vol. 55, no. 9, (2013), doi: 10. 1002/mop, pp. 2110-2113.

[Pub42] W. Skarbek, M. Tomaszewski: „Quaternion Epipolar Decomposition for Camera Pose Identification and Animation", *Opto-Electronics Review*, vol. 21, no .1 (2013), pp. 63-78.

[Pub43] K. Wnukowicz, G. Galiński: „Performance of Multi Camera Views' Detection using MPEG-7 Visual Signature Tools", *Opto-Electronics Review*, vol. 21, no .1 (2013), pp. 79-85.

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.

[Pub44] A. Abramowski, G. Brzuchalski, G. Pastuszak, M. Roszkowski, M. Wieczorek, J. Naruniec: „Zintegrowany system dekodowania źródłowego dla zdalnej kontroli audiowizualnej" (Integrated Source Decoding System for Remote Control of Audiovisual), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne*, vol. LXXXII, no. 6 (2013), pp. 559-562.

[Pub45] A. Badawika, J. Kołakowski: „Układ detekcji i lokalizacji osób z wykorzystaniem ultraszerokopasmowego radaru" (Detection and Localization System Using Ultra-wideband Radar), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne*, vol. LXXXII, no. 6 (2013), pp. 392-395.

[Pub46] P. Bajurko: „Pomiary czasowo-przestrzenno-częstotliwościowych charakterystyk sterowanych mikrofalowych systemów antenowych" (Measurements of the Time-Spatial-Frequency Steerable Antenna Systems), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne*, vol. LXXXII, no. 6 (2013), pp. 201-204.

[Pub47] P. Bajurko, K. Godziszewski, Y. Yashchyshyn: „Rozwój technik pomiarowych parametrów materiałów w zakresie do częstotliwości subterahercowych" (The Development of Measurement Techniques for Parameters of Materials in the Subterahertz Frequencies), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne*, vol. LXXXII, no. 6 (2013), pp. 365-368.

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[Rep1] D. Gryglewski, W. Wojtasiak: *"Opracowanie demonstratora technologii radaru śledzącego do kierowania artylerią przeciwlotniczą"* (The Development of Anti-aircraft Artillery Radar Tracking Technology Demonstrator), Final report for the National Centre for Research and Development, Warsaw, Jun. 2013.

[Rep2] D. Gryglewski: *„Opracowanie konstrukcji prototypów i wykonanie wymacniaczy wysokich częstotliwości"* (Development Prototype Design and Implementation of High-frequency Amplifiers), Final report for CAMSAT Gralak Przemysław, Warsaw, Jul. 2013.

[Rep3] W. Gwarek: *"Innovative Technologies of Multi-functional Materials and Structures for Nanoelectronics, Photonics, Spinotronics and Sensors"* (Innowacyjne technologie wielofunkcyjnych materiałów i struktur dla nanotechniki, fotoniki, spinotroniki i technik sensorowych), Final report for the INTechFun Project, Institute of Radioelectronics, WUT, Warsaw, Dec. 2013.

[Rep4] W. 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, M. Lubiejewski: *„Techniki modelowania elektromagnetycznego i termodynamicznego oraz projektowania układów mikrofalowych i optoelektronicznych"* (Techniques for Modelling the Electromagnetic and Thermodynamic and Design of Microwave and Optoelectronic Circuits), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2013.

[Rep5] S. L. Hahn: *„A modified proposal of experimental verification of the hypothesis of the noise generated by quantum vacuum",* Final report no. 1, Institute of Radioelectronics, WUT, Warsaw, Feb. 2013.

[Rep6] S. L. Hahn: *„New proposal for experimental verification of the origin of Microwave Backgroung radiation using mm wave radio astronomical observation of the dark moon"*,Final report no. 2, Institute of Radioelectronics, WUT, Warsaw, Oct. 2013.

[Rep7] 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. 2013.

[Rep8] J. Kołakowski, J. Cichocki, R. Michnowski, K. Radecki, W. Kiełek, S. Żmudzin, P. Makal, P. Ziętek: *"Badanie propagacji impulsów ultraszerokopasmowych w wybranych materiałach"* (Investigation of UWB Impulse Propagation in Selected Materials), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2013.

[Rep9] P. Kopyt: *„Zintegrowana antena czujnika zasilanego zdalnie"* (Integrated Antenna with a Remotely Supplied Sensor), Final report for TELECOM, Telcom, Athens, Greece, Warsaw, Apr. 2013.

[Rep10] P. Kopyt: *"Opracowanie ekspertyzy dotyczącej działania anten drukowanych zgodnych ze standardem EPC Global Gen2 umieszczonych nad płaszczyzną masy"* (Design the Experitise on Printing Antenna according to EPC Global Gen2 Standard Placed above to Weight Plane), Final report for the Polish Security Printing Works Ltd., Dec. 2013.

[Rep11] P. Kopyt: *"Opracowanie ekspertyzy dotyczącej sposobu poprawiania skuteczności promieniowania anten drukowanych umieszczonych nad płaszczyzną masy"* (Design the Experitise on Improvement the Effectiveness of Printing Antenna Radiation Placed above to Weight Plane), Final report for the Polish Security Printing Works Ltd., Dec. 2013.

[Rep12] Z. Kulka, P. Bobiński, E. Kotarbińska, A. Leszczyński, M. Lewandowski, M. Tajchert, J. Żera: *„Design and investigation of electroacoustic measuring systems and digital audio signal processing systems"* (Projektowanie i badania systemów elektroakustycznych oraz systemów cyfrowego przetwarzania sygnałów fonicznych), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2013.

[Rep13] J. Modelski, Y. Yashchyshyn, M. Bury, K. Derzakowski, T. Keller, K. Kurek, J. Naruniec, G. Pastuszak, B. Sawionek, A. Abramowski, P. Bajurko, K. Bryłka, G. Brzuchalski, M. Darmento, M. Jakubowski, S. Kozłowski, A. Linkowski, B. Majewski, M. Morgoś, Ł. Mosdorf, M. Mosdorf, A. Jefimowicz, M. Klocek, A. Kurek, M. Roszkowski, A. Rudziński, A. Skrzypkowski R. Szumny, M. Wieczorek: *"Integrated Mobile System for Counterterrorism and Rescue Operations"* (Zintegrowany mobilny system wspomagający działania antyterrorystyczne i antykryzysowe), Final report for the PROTEUS project, Institute of Radioelectronics, WUT, Warsaw, Aug. 2013.

[Rep14] J. Modelski, M. Dąbrowski: *„Badanie architektur odbiorników cyfrowej telewizji naziemnej standardu DVB-T2"* (Study of Digital Terrestrial Television Receiver Architectures for DVB-T2 Standard), Final

report for the National Science Center, WUT, Warsaw, Oct. 2013.

[Rep15] J. Modelski, T. Keller, K. Kurek, M. Piasecki, K. Bryłka, M. Dąbrowski: *„Metody modyfikacji algorytmu szyfrującego AES w systemach transmisji danych do zastosowań kosmicznych”* (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. 2013.

[Rep16] J. Modzelewski, H. Chaciński, W. Kazubski, M. Mikołajewski: *“Nowe zastosowania kluczowych rezonansowych wzmacniaczy mocy w.cz. w nadajnikach radiowych i w elektronice przemysłowej”* (New Applications of High-Frequency Switch-Mode Tuned Power Amplifiers in Radio Transmitters and Industrial Electronics), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2013.

[Rep17] 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. 2013.

[Rep18] R. Z. Morawski, A. Miękina, C. Niedziński, A. Podgórski, N. Obarski, G. Żukowska: *„Metody i algorytmy przetwarzania danych pomiarowych w spektrometrycznych analizatorach żywności”* (Methods and Algorithms of Measurement Data Processing in Spectrophotometric Analysers of Food), Final report for the National Science Center, WUT, Warsaw, Mar. 2013.

[Rep19] A. Przelaskowski, G. Ostrek, R. Jóźwiak, M. Jasionowska, A. Rutczyńska: *„Modelowanie zaburzeń architektury jako symptomu raka sutka z wykorzystaniem falek zespolonych*” (Modelling for the Detection of Architecture Distortions in Diagnosis of Breast Cancer Symptoms using Complex Wavelet Domain), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2013.

[Rep20] R. Szabatin, W. Smolik, P. Czarnecki, J. Mirkowski, T. Olszewski: *„Elektryczny tomograf pojemnościowy ET(V4) do trójwymiarowego obrazowania procesów dynamicznych”* (ET(V4) Electrical Capacitance Tomograph for 3D Imaging of Dynamic Progresses), Final report for the National Centre for Research and Development, Warsaw, Sept. 2013.

[Rep21] W. Skarbek, J. Naruniec, M. Tomaszewski: *„Moduły AAM, kody źródłowe”* (AAM Modules, Source Codes), Final report for the Samsung Electronics Polska Ltd., Institute of Radioelectronics, WUT, Warsaw, Dec. 2013.

[Rep22] W. Winiecki, P. Bilski, P. Czernik, R. Łukaszewski, K. Mroczek, J. Olszyna: *„Rozwój metod projektowania stacjonarnych i rozproszonych systemów pomiarowych”* (Development of Stationary and Distributed Measuring Systems Designing Methods), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2013.

[Rep23] 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 2013.

[Rep24] W. Wojtasiak, D. Gryglewski: *„Dostawa generatora częstotliwości podstawowej do klistromu”* (Delivery the Basic Frequency Generator for Klystron), Final report for National Centre for Nuclear Research, Warsaw, Aug. 2013.

[Rep25] W. Wojtasiak, D. Gryglewski: *„Wykonanie analizy w zakresie wpływu zabudowy w rejonie Centrum Handlowego Okęcie w Warszawie na wskazania radarów, pierwotnego i wtórnego tj. ASR9/MSSR oraz ASR 10/IRS20 będących w zarządzaniu Polskiej Agencji Żeglugi Powietrznej w rejonie lotniska Okęcie”* (Analysis of the Impact of Building in the Area of the Okęcie Shopping Center to Identify the Primary and Secondary Radars, ie. ASR9/MSSR and ASR10 /IRS20 being in Managing of the Polish Air Navigation Services Agency in the Area of Okęcie Airport), Final report for STUDIO QUADRA Ltd., Warsaw, Nov. 2013.

[Rep26] W. Wojtasiak, D. Gryglewski: *„Wykonanie analizy w zakresie wpływu zabudowy w rejonie dworca kolejowego w Warszawie”* (Analysis of the Impact of Building in the Area of the Railway Station in Warsaw), Final report for FS & Arcus Ltd., Warsaw, Nov. 2013.

[Rep27] Y. Yashchyshyn, K. Derzakowski, M. Bury, P. Bajurko, A. Urzędowska, K. Godziszewski, B. Majewski: *„Nowe rodzaje inteligentnych anten z cyfrowym kształtowaniem wiązki o rekonfigurowalnej elektronicznie aperturze”* (New Types of Smart Antennas with Digital Beamforming based on Electronically Reconfigurable Aperture), Final report for the National Science Center, Warsaw, Apr. 2013.

[Rep28] Y. Yashchyshyn, K. Derzakowski, M. Bury, P. Bajurko, A. Urzędowska, K. Godziszewski, B. Majewski: *„Rozbudowa stanowiska pomiarowego do pomiarów w paśmie milimetrowym i subterahercowym – realizacja anten wzorcowych”* (Further Development of Test Bench for Measurement in Millimeter and Subterahertz Frequency Band – Design of Standard Antennas), Final report for the statutory

grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2013.

[Rep29] 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. 2013.

PATENTS AND PATENT APPLICATIONS

[Pat1] A. Barwicz, R. Morawski, S. Lesueur, A. Miękina, T. Oleszczak: *„Flash optical performance monitor”*, Patent 1 685 663 B1, *European Patent* No 1 685 663 B1, issued on Oct. 16, 2013.

[Pat2] P. Kopyt, P. Węgrzyniak, M. Krok, W. Gwarek: *„Zasilane zdalnie urządzenie transmisji danych pomiarowych”* (Remotely powered data transmission device), Patent P-384303, Jun. 10, 2013.

[Pat3] B. Salski, W. Gwarek: *„Czujnik elektromagnetyczny do badania stanu strukturalnego materiałów przewodzących”* (Electromagnetic sensor to study the structural condition of conductive materials), Patent application P-404769, Jul. 18, 2013.

[Pat4] W. Smolik, B. Radzik, R. Szabatin, P. Brzeski, J. Kryszyn, T. Olszewski: *„Układ ładuj-rozładuj do pomiaru małych pojemności”* (Charge-discharge system for small capacity measurement), Patent application P-404230, Jun. 06, 2013.

8. SCIENTIFIC EVENTS

8.1 Scientific events co-organized by the Institute

[Con1] *Computer Analysis of Cardiac PET/SPECT CT and MRI Studies* (Komputerowa analiza badań kardiologicznych PET/SPECT CT i MRI), open seminar organized by the Nuclear and Medical Electronics Division.

8.2. International scientific events

[Con2] *International Symposium: New Technologies in Telecommunications* (Lviv, Ukraine, Jan. 21-25, 2013), Y. Yashchyshyn (speaker).

[Con3] *11th International Conference on Adaptive and Natural Computing Algorithms* (Lusanne, Switzerland, Apr. 3-6, 2013), P. Płoński (participant).

[Con4] *7th European Conference on Antennas and Propagation: EuCAP 2013* (Gothenburg, Sweden, Apr. 8-12, 2013), Y. Yashchyshyn (speaker).

[Con5] *134 International Engineering Society Convention* (Rome, Italy, May 4-7, 2013), Z. Kulka (speaker).

[Con6] *IEEE Central European Student Branch Congress 2013* (Opole, Poland, May 13, 2013), J. Modelski (speaker).

[Con7] *International Conference: Composites and Ceramic Materials Technology, Application and Testing 2013* (Białowieża, Poland, May 13-15, 2013), Y. Yashchyshyn (speaker).

[Con8] *International Conference on Heating by Electromagnetic Sources: HES-13* (Padua, Italy, May 21-24, 2013), A. Więckowski, P. Korpas, M. Krysicki (speakers).

[Con9] *15th Seminar: Computer Modeling in Microwave Engineering and Applications* (Padua, Italy, May 23-24, 2013), A. Więckowski, P. Korpas, M. Krysicki (speakers).

[Con10] *XXXIth IEEE-SPIE Joint Symposium on Photonics, Web Engineering, Electronics for Astronomy and High Energy Physics Experiments* (Wilga, Poland, May 26-Jun. 02, 2013), J. Olszyna, P. Czernik (speakers).

[Con11] *International Microwave Symposium* (Seattle, US, May 31-Jun. 7, 2013), J. Modelski (member of the Scientific Committee, AdCom MTT-S IEEE).

[Con12] *The 10th Jubilee International Conference on Marine Navigation and Safety of Sea Transportation: TransNav 2013* (Gdynia, Poland, Jun. 19-22, 2013), T. Keller (speaker).

[Con13] *47th Annual Microwave Power Symposium* (Providence, USA, Jun. 25-27, 2013), W. Gwarek (speaker).

[Con14] *XVth Międzynarodowe Sympozjum Inżynierii i Reżyserii Dźwięku: ISSET 2013* (International Symposium on Sound Engineering and Tonmeistering) (Kraków, Poland, Jun. 27-29, 2013), Z. Kulka, P. Bobiński, A. Rogowska (speakers), J. Żera (participant).

[Con15] *16th Euromicro Conference on Digital System Design: DSD 2013* (Santander, Spain, Sept. 3-7, 2013), A. Abramowski (speaker), M. Trochimiuk (participant).

[Con16] *TC1+TC7+TC13 Symposium* (Genova, Italy, Sept. 4-6, 2013), R. Morawski (session chairman, speaker).

[Con17] *International Interdisciplinary PhD. Workshop* (Brno, Czech Republic, Sept. 8-11, 2013), J. Kryszyn, P. Wróblewski (participant).

[Con18] *7th IEEE IDAACS* (Berlin, Germany, Sept. 12-14, 2013), W. Winiecki, K. Liszewski (speakers).

[Con19] *E-MRS 2013 FALL MEETING* (Warsaw, Poland, Sept. 16-20, 2013), Y. Yashchyshyn (speaker).

[Con20] *European Microwave Week: EuMW 2013* (Nürnberg, Germany, Oct. 6-11, 2013), J. Modelski (co-chair of session, General Assembly member, member of the Technical Programme Committee), W. Gwarek (invited speaker), Y. Yashchyshyn, M. Olszewska (speaker).

[Con21] *40 Międzynarodowa Konferencja i Wystawa PIKE 2013* (40th International Conference and Exhibition PIKE 2013) (Łódź, Poland, Oct. 14-17, 2013), J. Modelski (president of the Programme Council).

[Con22] *2013 International Symposium on Antennas and Propagation: ISAP 2013* (Nanjing, China, Oct. 23-25, 2013), J. Modelski (invited speaker, session co-chair).

[Con23] *Asia-Pacific Microwave Conference 2013* (Korea, Seoul, Nov. 5-8, 2013), Y. Yashchyshyn (invited speaker).

[Con24] *52nd IEEE Conference on Decision and Control* (Florence, Italy, Dec. 6-11, 2013), J. Wojciechowski (participant).

8.2. National scientific events

[Con25] *XI Konferencja Naukowa: Technologia Elektronowa: ELTE 2013* (XIst Scientific Conference: Electron Technology) (Ryn, Poland, Apr. 16-20, 2013), Y. Yashchyshyn (speaker).

[Con26] *XXIII Ogólnopolski Zjazd Dziekanów Wydziałów Elektrycznych, Elektroniki, Telekomunikacji, Automatyki i Robotyki oraz Informatyki* (XXIIIrd National Congress of Deans of Faculties: Electrical, Electronic, Telecommunications, Automation and Robotics, and Computer Science)

(Kielce, May 16-18, 2013), J. Modelski (invited speaker).

[Con27] *XII Sympozjum: "Modelowanie i Pomiary w Medycynie"* (XIInd Symposium „Modelling and Measurement in Medicine") (Krynica Zdrój, Poland, May 19-23, 2013), D. Radomski (participant).

[Con28] *Krajowa Konferencja Radiokomunikacji, Radiofonii i Telewizji: KKRRiT 2013* (National Conference on Radiocommunications and Broadcasting) (Wrocław, Poland, Jun. 10-12, 2013), J. Modelski (session chair, member of the Programme Committee), J. Cichocki (session chair, member of the Programme Committee), Y. Yashchyshyn (session chair, member of the Programme Committee), A. Badawika, A. Buchowicz, T. Buczkowski, J. Jarkowski, W. Kazubski, T. Keller, J. Kołakowski, K. Godziszewski R. Korycki, A. Łysiuk, R. Michnowski, K. Radecki, M. Kucharski, P. Osiak, T. Szczerba, M. Sztybor (speakers).

[Con29] *XII Krajowa Konferencja Elektroniki* (XIInd National Conference on Electronics) (Darłówko Wschodnie, Poland, Jun. 10-13, 2013), T. Morawski (member of the Scientific Committee), M. Mikołajewski, J. Modzelewski (speakers).

[Con30] *VI Kongres Metrologii* (VIth Congress of Metrology) (Kielce-Sandomierz, Jun. 19-22, 2013), R. Z. Morawski, W. Winiecki (members of the Scientific Committee, speakers), R. Łukaszewski, P. Czernik, J. Olszyna, P. Zawistowski (speakers).

[Con31] *XXIX Krajowe Sympozjum Telekomunikacji i Teleinformatyki: KSTiT 2013* (XXIX National Symposium on Telecommunications and Teleinformatics) (Gdańsk, Poland, Sept. 4-6, 2013), J. Modelski, W. Skarbek (members of the Programme Committee).

[Con32] *60-te Otwarte Seminarium z Akustyki: OSA 2013* (Rzeszów-Polańczyk, Poland, Sept. 9-13, 2013), A. Rogowska (speaker), J. Żera (participant).

[Con33] *75 lecie rocznicy pierwszej emisji telewizyjnej w Polsce* (75th Anniversary of the First Television Broadcast in Poland) (Warsaw, Poland, Oct. 7, 2013), J. Modelski (outstanding scientists' discussion panel participant).

[Con34] *XVIII Krajowa Konferencja Biocybernetyki i Inżynierii Biomedycznej* (XVIIIth National Conference on Biocybernetics and Biomedical Engineering) (Gdańsk, Poland, Oct. 10-12, 2013), P. Bogorodzki (speaker).

[Con35] *XIV Seminarium Stypendystów Fundacji Wspierania Rozwoju Radiokomunikacji i Technik Multimedialnych* (XIVth Seminar Scholarship Holders of Foundation for the Development of Radiocommunications and Multimedia Technologies), (Warsaw. Poland, Dec. 4, 2013) A. Buchowicz, J. Kołakowski, Y. Yashchyshyn (session chair), A. Badawika, G. Bogdan, G. Borowik, Ł. Błaszczyk, G. Dziarmaga, M. Krysicki, P. Osiak, P. Piasecki, A. Raniszewski, K. Snopek, M. Sztybor, R. Zawiślak (speakers).

9. AWARDS AND DISTINCTIONS

State Medals

Medal Komisji Edukacji Narodowej (Medal of National Education Commitee)

Wojciech Gwarek, Prof. D.Sc.,
Zbigniew Kulka, Prof. D.Sc.,
Stanisław Rosłoniec, Prof. D.Sc.,
Jacek Cichocki, Ph.D.,
Andrzej Leszczyński, Ph.D.

The Stanisław Staszic Nationwide Competition

Wojciech Wojtasiak, Ph.D.,
Daniel Gryglewski, Ph.D.,
Dawid W. Rosołowski, Ph.D.
"2013 Innovation Laurel" a team award for the best innovative project "Microwave Transverter".

Awards granted by international organizations

IEEE MTT-S Distinguished Service Award

Józef Modelski, Prof. D.Sc.
Individual award in recognition of his long-lasting contributions to the international microwave society

Institute of Measurement and Control, UK
The Ludwik Finkelstein Medal 2013

Roman Morawski, Prof. D.Sc.

Awards granted by national organizations

Award Granted by Teleinformatics Community

Józef Modelski, Prof. D.Sc.
Individual award „Golden Cyborg"

The Paweł J. Nowacki Medal

Tadeusz Morawski, Prof. D.Sc.

The Prof. T. Hanausek Competition Award

Rafał Korycki, Ph.D.
Individual award granted by Polish Criminalistic Association for the Ph.D. thesis.

Award of Audio Engineering Society

Zbigniew Kulka, Prof. D.Sc.
Fellowship award in recognition of his outstanding and continued contributions to audio technology education and his dedication to the Polish Section of the Audio Engineering Society.

Awards of the Rector

Piotr Bogorodzki, D.Sc.
Individual II° scientific award for the D.Sc. thesis.

Tymon Rubel, Ph.D.
Individual II° scientific award for the researches from genomics and proteomics conducted in the frame of co-operation with the Institute of Biochemistry and Biophysics, Polish Academy of Science and Center of Oncology in Warsaw.

Wiesław Winiecki, Prof. D.Sc.
Individual III° award for the organizational achievements in academic year 2012/2013.

Paweł Bajurko, Ph.D.
Individual III° award for the scientific achievements in year 2012.

Krzysztof Zaremba, Prof. D.Sc.
Janusz Marzec, D.Sc.
Michał Dziewiecki, Ph.D.
Marcin Ziembicki, M.Sc.
Andrzej Rychter, M.Sc.
Team I° award for the attendance in two, prestigious international projects connected with the high energy physics experiments.

Roman Z. Morawski, Prof. D.Sc.
Jan Żera, D.Sc.
Bartłomiej Salski, Ph.D.
Maciej Sypniewski, Ph.D.
Team I° teaching award for preparing courses and lecturing within the programme of international students exchange ATHENS.

Jerzy Kołakowski, Ph.D.
Jacek Cichocki, Ph.D.
Ryszard Michnowski, Ph.D.
Team II° didactic award for the development of new advanced academic course titled: *"Ultrawideband Technologies"*.

Yevhen Yashchyshyn, D.Sc.
Sebastian Kozłowski, Ph.D.
Anna Łysiuk, M.Sc.
Konrad Godziszewski, M.Sc.
Team II° didactic award for the development of new advanced academic course titled: *"Modern Radio Transmission Techniques"*

Awards granted for the conference papers and posters

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

Paweł Bajurko, Ph.D. – the second award
Mariusz Jakubowski, M.Sc. – honorary diploma

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

For preparing D.Sc. Thesis

K. Snopek

For preparing Ph.D. Thesis

A. Łysiuk

For preparing M.Sc. Thesis

A. Badawika
Ł. Błaszczyk
G. Bogdan
G. Dziarmaga
W. Januszewski
D. Kuchta
P. Osiak
P. Piasecki
W. Szelągowski
M. Sztybor
R. Zawiślak

For preparing B.Sc. Thesis

M. Krysicki
A. Raniszewski
J. Wilkowski

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

SPECIFICATION	2009	2010	2011	2012	2013
academic staff [posts] total	63,25	62,08	65,5	64,55	60,68
tenured professors	5	4,5	4,5	4,5	5
professors	8	8	9	9	7,5
associate professors	0,5	0,5	0	1	0
assistant professors	39	38,75	41,6	41,65	39,90
readers	4	4,33	4,25	2,25	1
senior lecturers	4,5	4	4	3,5	4,53
assistants	2,25	2	2,15	2,65	2,75
Ph.D. students [persons] total	36	39	37	34	39
regular, the third level studies	23	23	23	19	27
without scholarship	13	16	14	15	12
technical and administrative staff [posts] total	18,9	18,4	19,2	17,6	19,75
senior R&D associates	2,4	2,9	2,5	2,5	1,75
R&D associates	4,75	4,75	4,35	4	5,5
administrative associates	9	9	10,35	9,1	10,5
service workers	2	2	2	2	2
temporary staff (projects: Proteus, Lider, ENIAC)	4,8	12,5	8,1	6,8	4,3
library resources books (volumes)	15924	16055	10993	11140	11165
books (titles)	8774	8888	7204	7251	7276
journals (subscribtions)	126	83	83	83	83
teaching activities basic courses	63	67	67	69	69
advanced courses	25	27	23	34	34
other courses	58	73	47	51	54
international lectures and courses	2	2	2	2	3
research projects total	48	47	40	44	47
international	9	4	4	4	5
granted by Ministry	15	19	17	19	22
granted by the University	18	20	17	15	12
other	9	4	2	6	8
research projects budget **PLN:** **Euro:**	6 853232	6 555168	4 987642 + 1 500000*	5 349402	5 536690
titles and degrees awarded Prof. titles	-	-	1	1	2
D.Sc. degrees	-	-	-	1	-
Ph.D. degrees	6	6	4	7	8
M.Sc. degree (regular studies + evening studies)	67+8	57+10	62+3	66+3	61+7
M.Sc. degree (studies in English)	-	2	-	-	1
B.Sc. degrees (regular studies + evening studies)	65+7	77+11	84+11	123+7	106+3
B.Sc. degrees (studies in English)	5	3	7	4	3
B.Sc. degrees (distant learning)	2	-	2	4	1
publications total	197	206	165	172	182
sci.-tech. books and chapters in books	12	9	6	5	7
sci.-tech. papers in journals - total	100	94	76	54	76
JCR-ICI list (IF>0)	21	20	20	26	36
MSHE list	72	67	55	27	37
in other journals	7	7	1	1	3
sci.-tech. papers in conference proceedings	58	74	74	95	74
other publications	27	29	9	18	25
research reports	26	22	24	28	29
conferences attended by the staff	60	40	41	46	35

* 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)