INSTITUTE OF RADIOELECTRONICS AND MULTIMEDIA TECHNOLOGY

WARSAW UNIVERSITY OF TECHNOLOGY

FACULTY OF ELECTRONICS AND INFORMATION TECHNOLOGY

ANNUAL REPORT

2015

Warsaw, February 2016

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From the Director

Welcome to the 2015 edition of the Annual Report issued by the Institute of Radioelectronics and Multimedia Technology !

The year 2015 was a special one in the history of the Institute of Radioelectronics. This was the 45th year of its existence, during which the name of the institute was changed by adding a new segment. Therefore, since the September 2015, the official name is the Institute of Radioelectronics and Multimedia Technology.

The Institute of Radioelectronics was founded in 1970 after merging five departments with significantly varying professional profiles: Department of Radiotechnical and Television Devices, Department of Radiolocation, Department of Electroacoustic, Department of Radiology and Department of Construction of Electromedical Devices. Finding the common topics for the academic activities for all these departments was difficult. Therefore the Institute was given a general name, which suggested the electronics domain as the main research interest. On the other hand, the name was intended to expose the frequency-based approaches during the scientific investigations: acoustic vibrations, radio waves, or nuclear radiation. The name remained unchanged since the beginning, despite such changes being made for the Faculty and all other institutes, considering the evolution of both their structures and the electronics and information technologies domains in the world. Similar premises were the basis of the application for the change of the Institute of Radioelectronics name in 2015. On one side, the importance of the multimedia technologies in the Institute activities significantly increased. On the other, the multimedia gained a worldwide acceptance in the world, leading to the increase of the demand for the corresponding educational and research services.

Since at least twenty years our academic staff is involved with teaching of the development and applications of multimedia technologies for both the first and the second level of studies (stationary and extramural). They offer over 20 courses belonging to this category. The Institute is the force behind the animation and implementation of the *Radiocommunication and multimedia technology* specialization in the first level of studies. We proposed the postgraduate studies including significant number of multimedia courses: Postgraduate Studies of Audiology Technologies, Postgraduate Studies of the Noise Protection and Postgraduate Studies of Radio Transmission Systems and Multimedia Technologies. Only during the years 2005-2014 in the Institute over 300 diploma Theses were created, devoted to the development and applications of multimedia technologies. Multiple PhD Theses referring to such topics were successfully defended. The scientific activities of the divisions (out of five) is devoted to the multimedia technologies. Two of them (Television Division and Electroacoustics Division) work on developing new methods and their general applications, while the third one (Division of Nuclear and Medical Electronics) develops their applications in the medicine and industrial diagnostics.

During the last two decades we travelled far, from the electronics-equipment institute to the interdisciplinary one specializing in the telecommunication, electronics and computer science. The new name ensures the continuity of the organizational structure and allows for its easy identification. It better represents the structure of the academic activities and well fits the name of the Faculty, being its logical specification: from “electronics” to “radioelectronics” and from “information technologies” to “multimedia technology”.

A very important achievement in 2015 was the expansion of the laboratory resources. A number of new facilities were assembled, equipped with the world-class instrumentation, particulary in the: Wide-band Wireless Systems Laboratory, Space Technologies Laboratory, Terahertz Laboratory and Biomedical Laboratory. In total, the institute laboratories enriched with the equipment worth over 7 million PLN.

The year 2015 also stands out from the perspective of the development of the higher level research staff, including three new scientists having obtained the DSc degree: Dr. G. Pastuszak, Dr. B. Salski and Dr. W. Wojtasiak. Our staff also continues the excellent tradition of victories in a student competition for the best teachers. This year, the Golden Chalks were awarded our colleagues, Dr. B. Salski and Dr. T. Rubel.

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

Warsaw, February 2016

Professor Józef Modelski

Classification of publications presented in this Report
is in accordance with the rules in force in 2015

Contents

1. GENERAL INFORMATION

1.1. Mission of the Institute

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

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

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Director's Representative for Economy & Administration

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1.3. Organisation of the Institute

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

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

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

1.3.1. Electroacoustics Division

Head of Division

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Senior academic staff

Zbigniew Kulka, Prof. D.Sc., Professor (0.5)
Wiesław Winiecki, Prof. D.Sc., Professor
Piotr Bilski, D.Sc., Associate Professor (0.75 till Sept. 2015, 1 from Oct. 2015)
Ewa Kotarbińska, Ph.D., Assistant Professor (0.25)
Marcin Lewandowski, Ph.D., Assistant Professor
Robert Łukaszewski, Ph.D., Assistant Professor
Grzegorz Makarewicz, Ph.D., Assistant Professor (0.5)
Krzysztof Mroczek, Ph.D., Assistant Professor
Maria Tajchert, Ph.D., Assistant Professor (0.4 till Sept. 2015)
Piotr Bobiński, Ph.D., Senior Lecturer

Technical staff

Grzegorz Makarewicz, Ph.D., Senior Development Engineer (0.5)

Ph.D. Students

Jakub Pach, M.Sc., from Feb. 2013
Bartosz Połok, M.Sc., from Oct. 2015
Agnieszka Pietrzak, M.Sc., from Feb. 2015
Agata Rogowska, M.Sc., from Oct. 2012
Augustyn Wójcik, M.Sc., from Oct. 2015
Piotr Zawistowski, M.Sc., from Oct. 2010
Bartosz Żłobiński, M.Sc., from Feb. 2015

Retired

Andrzej Leszczyński, Ph.D.

The activities of the Division concern electroacoustics and digital audio techniques, including investigations, measurements and applications. They are focused on:

- foundamentals of acoustics;
- electroacoustics;
- psychoacoustics;
- digital audio;
- design and measurements of electroacoustic transducers;
- investigation and modeling of acoustic field distribution;
- noise control and active noise reduction;
- architectural and industrial acoustics;
- sound studio techniques;
- hearing protection.

Current research topics include:

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

The other field of interest concerns fundamental and applied research associated with metrology, instrumentation and measuring systems. It is focused on design of automated computer-based measuring systems. Current research topics include:

- modern information technologies, e.g. LabVIEW, Java, XML, and modern communication technologies, e.g. the Internet, GSM, Bluetooth, ZigBee in distributed control and measuring systems;
- virtual instrumentation, plug-in boards for data acquisition, IEEE-488 equipment;
- artificial intelligence methods in diagnostics of analog systems.

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

1.3.2. Microwave and Radiolocation Engineering Division

Head of Division

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Senior academic staff

Stanisław Rosłoniec, Prof. D.Sc., Tenured Professor (0.5)

Bartłomiej Salski, D.Sc., Associate Professor

Wojciech Wojtasiak, D.Sc., Associate Professor

Małgorzata Celuch, Ph.D., Research Assistant Profesor (0.5 till Feb. 2015, 0.4 from Mar. 2015)

Daniel Gryglewski, Ph.D., Assistant Professor

Paweł Kopyt, Ph.D., Assistant Professor

Przemysław Korpas, Ph.D., Assistant Professor (from Dec. 2015)

Przemysław Miazga, Ph.D., Assistant Professor

Dawid Rosołowski, Ph.D., Assistant Professor

Maciej Sypniewski, Ph.D., Assistant Professor

Technical staff

Mirosław Lubiejewski, Foreman

Ph.D. students

Marcin Góralczyk, M.Sc., from Oct. 2014

Tomasz Karpisz, M.Sc., from Feb. 2015

Mateusz Krysicki, M.Sc., from Oct. 2014

Dawid Kuchta, M.Sc., from Oct. 2014

Adam Raniszewski, M.Sc., from Feb. 2015

Retired

Tadeusz Morawski, Prof. D.Sc.

The Microwave and Radiolocation Engineering Division conducts scientific and applied research in the area of electromagnetic field theory, microwave theory and techniques, and measurement techniques for very high frequency ranges. This includes the subjects of computer-aided design, data acquisition and data processing. Specific research topics in 2015 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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Senior academic staff

Janusz Marzec, D.Sc., Professor

Piotr Bogorodzki, D.Sc., Professor

Waldemar Smolik, D.Sc., Associate Professor

Piotr Brzeski, Ph.D., Assistant Professor (1 till Sept. 2015, 0.5 from Oct. 2015)

Roman Szabatin, Ph.D., Assistant Professor (0.5)

Grzegorz Domański, Ph.D., Assistant Professor

Michał Dziewiecki, Ph.D., Assistant Professor

Bogumił Konarzewski, Ph.D., Assistant Professor

Robert Kurjata, Ph.D., Assistant Professor

Ewa Piątkowska-Janko, Ph.D., Assistant Professor

Dariusz Radomski, Ph.D., Research Assistant Professor

Tymon Rubel, Ph.D., Assistant Professor

Błażej Sawionek, Ph.D., Assistant Professor (0.5)

Tomasz Jamrógiewicz, M.Sc., Senior Lecturer (1 till Sept. 2015, 0.75 from Oct. 2015)

Tomasz Olszewski, M.Sc., Senior Lecturer

Junior academic staff

Jacek Kryszyn, M.Sc., Assistant (0.5 till Sept. 2015, 1 from Oct. 2015)

Jarosław Orzeł, M.Sc., Assistant (0.5)

Wojciech Obrębski, M.Sc., Assistant (0.5)

Andrzej Rychter, M.Sc., Assistant (1 from Dec. 2015)

Marcin Ziembicki, M.Sc., Assistant

Technical staff

Błażej Sawionek, Ph.D., Senior R&D Eng. (0.5)

Andrzej Wasilewski, Worker (1 from May 2015)

Joanna Witkowska, Specialist

Ph.D. students

Wojciech Gradkowski, M.Sc., from Oct. 2010

Bartosz Kossowski, M.Sc., from Oct. 2013

Jacek Kryszyn, M.Sc., from Oct. 2012

Agata Kubik, M.Sc., from Oct. 2015

Jarosław Orzeł, M.Sc., from Oct. 2013

Piotr Płoński, M.Sc., from Oct. 2010

Andrzej Rychter, M.Sc., from Oct. 2011

Mateusz Stosio, M.Sc., from Oct. 2015

Maciej Szczepankowski, M.Sc., from Oct. 2015

Konrad Werys, M.Sc., from Feb. 2011

Michał Wieteska, M.Sc., from Feb. 2015

Przemysław Wróblewski, M.Sc., from Oct. 2013

Retired:

Zdzisław Pawłowski, Prof. D.Sc.

The research and teaching activities carried out in the Nuclear and Medical Electronics Division are concentrated on two areas: biomedical engineering and nuclear electronics. Research in the interdisciplinary area of biomedical engineering covers a broad range of topics and

integrates sophisticated electronics and information technology with elements of medical knowledge. The activity in the area of nuclear engineering is concentrated on the design of electronics systems and data processing software for high energy physics experiments. The Division's research is focused on the following topics:

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

Areas of recent studies include:

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

1.3.4 Radiocommunications Division

Head of Division

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Senior academic staff

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

Jacek Wojciechowski, Prof. D.Sc., Tenured Prof. (0.5)

Kajetana Snopek, D.Sc., Associate Professor

Jacek Cichocki, Ph.D., Reader

Paweł Bajurko, Ph.D., Assistant Professor

Marek Bury, Ph.D., Assistant Professor (0.25 till Sept. 2015)

Krzysztof Derzakowski, Ph.D., Assistant Professor

Wojciech Kazubski, Ph.D., Assistant Professor

Jerzy Kołakowski, Ph.D., Assistant Professor

Tomasz Kosiło, Ph.D., Assistant Professor (0.5)

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 (0.5)

Henryk Chaciński, M.Sc., Senior Lecturer (0.5 from Jan. 2015)

Tomasz Keller, Ph.D., Senior Lecturer (0.33)

Junior academic staff

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

Technical staff

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

Marek Marcinkowski, Senior Foreman (0.75)

Stanisław Żmudzin, M.Sc., Senior R&D Engineer (0.25)

Ph.D. students

Anna Badawika, M.Sc., from Oct. 2013

Łukasz Błaszczyk, M.Sc., from Oct. 2013

Adrian Bilski, M.Sc., from Feb. 2011

Grzegorz Bogdan, M.Sc., from Oct. 2013

Marcin Darmetko, M.Sc., from Feb. 2012

Vitomir Djaja-Jośko, M.Sc., from Oct. 2015

Konrad Godziszewski, M.Sc., from Feb. 2011

Tomasz Filipek, M.Sc., from Feb. 2012

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

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Andrzej Buchowicz, Ph.D., Assistant Professor
Grzegorz Galiński, Ph.D., Assistant Professor
Krystian Ignasiak, Ph.D., Assistant Professor
Andrzej Miękina, Ph.D., Assistant Professor
Jacek Naruniec, Ph.D., Assistant Professor
Andrzej Podgórski, Ph.D., Assistant Professor
Tomasz Krzymień, M.Sc., Senior Lecturer (0.5)

Junior academic staff

Marek Kowalski, M.Sc., Assistant (0.5 from Mar. 2015)

Ph.D. students

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

Retired

Marek Rusin, Ph.D.

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

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

1.4. Evening Studies and Continuing Education

1.4.1. Engineer Degree Evening Studies on Radiocommunications and Multimedia Technology

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1.4.2. Environmental Noise Course

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1.5. Other Institute's Units

1.5.1 Library

Curator

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1.5.2 Accounting Department

Head

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Staff

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Aleksandra Jefimowicz, M.A.
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Ewa Młynarczyk (till Jun. 2015)
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Zdzisława Fenikowska, M.A. (from Jul. 2015)
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1.5.3 Supply Section

Staff

Andrzej Laskowski
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Andrzej Skrzypkowski (0.75 till Apr. 2015, 0.5 from May 2015)
room: 419, phone: +48 22 2345018
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1.5.4 Office of the Fundation for the Development of Radiocommunication and Multimedia Technology

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[Edu1], [Edu20], [Edu68], [Edu69]; [Pro17], [Pro32]; [BSc46]; [Pub18], [Pub39], [Pub92], [Pub105], [Pub106], [Pub107], [Pub108], [Pub109], [Pub110], [Pub128], [Pub150], [Pub183].

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[Edu84]; [Pro9], [Pro34], [Pro42], [Pro49]; [MSc50], [MSc54], [MSc57]; [BSc29], [BSc64]; [Pub31], [Pub64], [Pub172], [Pub173], [Pub174], [Pub186], [Pub187], [Pub188], [Pub194], [Pub195], [Pub200].

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[Edu8], [Edu9], [Edu21], [Edu22], [Edu23], [Edu74]; [Pro34], [Pro43], [Pro45].

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[Edu12], [Edu43], [Edu47], [Edu104], [Edu106], [Edu118], [Edu119], [Edu123]; [Pro1], [Pro8], [Pro27], [Pro44]; [Pub1], [Pub49].

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[Edu32], [Edu102]; [Pro3], [Pro5], [Pro34], [Pro41]; [BSc73], [BSc75]; [Pub3], [Pub4], [Pub5], [Pub6], [Pub7], [Pub8], [Pub9], [Pub10], [Pub11], [Pub12], [Pub13], [Pub14], [Pub16], [Pub43], [Pub44], [Pub114], [Pub115], [Pub198], [Pub204].

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[Edu13], [Edu70], [Edu114], [Edu143]; [Pro26]; [MSc59]; [BSc52], [BSc76]; [Pub80], [Pub176].

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[Edu21], [Edu22], [Edu23], [Edu28], [Edu67]; [Pro12], [Pro13], [Pro15], [Pro16], [Pro25]; [PhD2]; [Pub24], [Pub29], [Pub52], [Pub72], [Pub73], [Pub82], [Pub83], [Pub127], [Pub162], [Pub163], [Pub189], [Pub190]; [Pat3].

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[Edu21], [Edu22], [Edu64], [Edu73], [Edu141], [Edu142]; [Pro35]; [MSc5], [MSc46], [MSc62]; [BSc32]; [Pub2], [Pub135].

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[Edu12], [Edu51], [Edu101]; [Pro2], [Pro28]; [MSc55]; [BSc17], [BSc27], [BSc38], [BSc51]; [Pub53], [Pub56], [Pub75], [Pub112], [Pub199].

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[Edu17], [Edu21], [Edu22], [Edu23], [Edu89], [Edu91]; [Pro4], [Pro5], [Pro34]; [MSc52]; [BSc57]; [Pub9], [Pub10], [Pub11], [Pub12], [Pub13], [Pub14], [Pub43], [Pub114], [Pub198], [Pub204].

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[Edu27], [Edu30], [Edu38], [Edu39], [Edu86]; [Pro7], [Pro30]; [Pub63], [Pub93], [Pub96], [Pub97], [Pub98], [Pub99], [Pub138], [Pub139], [Pub140], [Pub141], [Pub146], [Pub169], [Pub170], [Pub171].

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[Pro34]; [Pub28].

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[Edu96]; [Pro25].

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[Edu24], [Edu72], [Edu108]; [Pro15], [Pro18], [Pro25]; [Pub70].

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Golden Chalk Award (15’).
[Edu83], [Edu112]; [MSc14], [MSc36], [MSc58]; [BSc1]; [Pub23], [Pub32], [Pub33].

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[Edu28], [Edu44]; [Pro10], [Pro13], [Pro21], [Pro25], [Pro39], [Pro46]; [DSc2]; [MSc21], [MSc45]; [BSc49]; [Pub19], [Pub24], [Pub29], [Pub30], [Pub48], [Pub52], [Pub71], [Pub72], [Pub73], [Pub118], [Pub122], [Pub127], [Pub145], [Pub162], [Pub163], [Pub189]; [Pat3].

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[Edu15]; [Pro34]; [BSc24], [BSc25], [BSc35]; [Pub64], [Pub194], [Pub195].

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[Edu61], [Edu62], [Edu85], [Edu143]; [Pro26]; [PhD1], [PhD3], [PhD5]; [Pub74], [Pub148], [Pub165].

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[Edu45], [Edu65], [Edu82]; [Pro34], [Pro43], [Pro45]; [MSc23]; [BSc5], [BSc65]; [Pub54], [Pub130], [Pub131], [Pub132], [Pub192], [Pub202], [Pub203].

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[Edu53], [Edu54], [Edu125]; [Pro18], [Pro31]; [BSc23], [BSc50]; [Pub76], [Pub161].

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[Edu42]; [Pro25]; [Pub78].

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[Edu32], [Edu37], [Edu90]; [Pro34], [Pro43], [Pro45]; [MSc22]; [Pub54], [Pub130], [Pub132].

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[Edu128], [Edu141], [Edu142]; [MSc7], [MSc30].

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M.Sc. ('75), Ph.D. ('86), D.Sc. ('03); Prof. Title ('11); measurement and instrumentation; **Professor**, Electroacoustics Division.
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[Edu1], [Edu31], [Edu75], [Edu100], [Edu103]; [Pro7], [Pro17], [Pro32]; [MSc13], [MSc35], [MSc60]; [BSc36], [BSc42]; [Pub63], [Pub92], [Pub107], [Pub110], [Pub156], [Pub166], [Pub167].

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M.Sc. (electronics '66), M.Sc. (mathematics '75), Ph.D. ('76), D.Sc. ('89); Prof. Title ('02); telecommunications, teleinformatics, signals and systems, computer aided design, graphs and networks, mathematical methods in engineering; **Tenured Professor**, Radiocommunications Division.
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[Edu79]; [Pub39].

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[Edu33]; [Pro14], [Pro15], [Pro18], [Pro25]; [DSc3]; [MSc12]; [BSc7]; [Pub34], [Pub47], [Pub55], [Pub70], [Pub82], [Pub83], [Pub84], [Pub117], [Pub133], [Pub190].

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M.Sc. ('79), Ph.D. ('86), D.Sc. ('06); antennae and antenna array; **Professor**, Radiocommunications Division, Head ('09-).
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[Edu3], [Edu23], [Edu63], [Edu87]; [Pro7], [Pro19], [Pro20], [Pro33]; [MSc48]; [BSc13], [BSc34], [BSc67]; [Pub15], [Pub35], [Pub40], [Pub45], [Pub58], [Pub63], [Pub67], [Pub68], [Pub81], [Pub86], [Pub87], [Pub101], [Pub179], [Pub182], [Pub196], [Pub197].

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M.Sc. ('81), Ph.D. ('90), D.Sc. ('03), Prof. Title (’12), Tenured Prof. (’14); biomedical engineering, nuclear electronics; **Tenured Professor**, Dean of the Faculty (’12-); Nuclear and Medical Electronics Division, Head ('03-).
Member of CERN ('89-); Member (’05-) and Vice-chairman of the University Council Committee on Property and Finances ('12-); Member of the Programme Board of the Institute of Applied Researches, WUT (’14-); Member of the Scientific Board of Inter. Forum on Innovative Technologies for Medicine ITMED (‘07-), Member of the Editorial Advisory Board of the *Polish Journal of Medical Physics and Engineering* (‘07-), Head of the Specialization *Electronics and Information Technology in Medicine* ('06-); Deputy Chairman of the Board of the Center for Imaging and Biomedical Research ('06-); Member of the Board of Polish Eastern Medical Cluster

('08-), Member of the Scientific Board of the National Centre for Nuclear Nuclear Research (’15-); Member of the Scientific Board of the Nałęcz Institute of Biocybernetics and Biomedical Engineering, Polish Academy of Science (’15-); Member of the Coordinating Committee (‘10-); Recipient of an individual award of the Rector (’15).
[Edu50], [Edu88]; [Pro3], [Pro4], [Pro5], [Pro6], [Pro34]; [MSc39]; [Pub3], [Pub4], [Pub5], [Pub6], [Pub7], [Pub8], [Pub9], [Pub10], [Pub11], [Pub12], [Pub13], [Pub14], [Pub16], [Pub17], [Pub43], [Pub114], [Pub198], [Pub204].

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[Edu23], [Edu35], [Edu80], [Edu143]; [Pro35]; [MSc34]; [BSc16]; [Pub20], [Pub121], [Pub154].

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

Ph.D. Student (tutor)

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Anna Badawika, M.Sc.	*(J. Modelski)*
Adrian Bilski, M.Sc.*	*(W. Winiecki)*
Łukasz Błaszczyk, M.Sc.	*(K. Snopek)*
Grzegorz Bogdan, M.Sc.	*(Y. Yashchyshyn)*
Błażej Czupryński, M.Sc.	*(W. Skarbek)*
Marcin Darmetko, M.Sc.	*(J. Modelski)*
Vitomir Djaja-Jośko, M.Sc.	*(J. Modelski)*
Tomasz Filipek, M.Sc.	*(J. Modelski)*
Konrad Godziszewski, M.Sc.	*(Y. Yashchyshyn)*
Marcin Góralczyk, M.Sc.	*(W. Wojtasiak)*
Wojciech Gradkowski, M.Sc.	*(P. Bogorodzki)*
Daniel Grzywczak, M.Sc.	*(W. Skarbek)*
Grzegorz Gwardys, M.Sc.	*(W. Skarbek)*
Tomasz Karpisz, M.Sc.*	*(W. Gwarek)*
Bartosz Kossowski, M.Sc.	*(P. Bogorodzki)*
Marek Kowalski, M.Sc.	*(W. Skarbek)*
Mateusz Krysicki, M.Sc.	*(W. Gwarek)*
Jacek Kryszyn, M.Sc.	(*W. Smolik)*
Agata Kubik, M.Sc.	*(P. Bogorodzki)*
Dawid Kuchta, M.Sc.	*(W. Wojtasiak)*
Paweł Mazurek, M.Sc.	*(R. Z. Morawski)*
Wojciech Obrębski, M.Sc.*	*(K. Zaremba)*
Jarosław Orzeł, M.Sc.	*(P. Bogorodzki)*
Jakub Pach, M.Sc.	(*P. Bilski)*
Przemysław Piasecki, M.Sc.	*(Y. Yashchyshyn)*
Wojciech Pieńkowski, M.Sc.*	*(J. Modelski)*
Agnieszka Pietrzak, M.Sc.	*(J. Żera)*
Piotr Płoński, M.Sc.*	(*K. Zaremba)*
Bartosz Połok, M.Sc.*	(*P. Bilski)*
Adam Raniszewski, M.Sc. *	*(W. Gwarek)*
Agata Rogowska, M.Sc.	*(J. Żera)*
Mikołaj Roszkowski, M.Sc.*	*(W. Skarbek)*
Andrzej Rychter, M.Sc.	*(J. Marzec)*
Mateusz Stosio, M.Sc.*	*(W. Smolik)*
Adam Strupczewski, M.Sc.*	*(W. Skarbek)*
Maciej Szczepankowski, M.Sc.*	*(P. Bogorodzki)*
Maciej Trochimiuk, M.Sc.	*(G. Pastuszak)*
Jakub Wagner, M.Sc.	*(R. Z. Morawski)*
Konrad Werys, M.Sc.	*(P. Bogorodzki)*
Michał Wieczorek, M.Sc.	*(G. Pastuszak)*
Michał Wieteska, M.Sc.	*(P. Bogorodzki*
Augustyn Wójcik, M.Sc.	*(W. Winiecki)*
Przemysław Wróblewski, M.Sc.	(*W. Smolik)*
Piotr Zawistowski, M.Sc.	*(W. Winiecki)*
Bartosz Żłobiński, M.Sc.	*(J. Żera)*

* without scholarship

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Izabela Dudek, Secretary
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3. TEACHING ACTIVITIES

(the summer semester of the academic year 2014/2015 and the winter semester of the academic year 2015/2016)

3.1. Regular studies – Main Fields of Study:

1. Telecommunications
Specialization: Radiocommunications and Multimedia Technology

Head

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

Head

Krzysztof Zaremba, Prof. D.Sc., Tenured Professor
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3.1.1. Basic courses

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[Edu16] *Construction of High Quality Audio Equipment* (Konstrukcja urządzeń audio wysokiej jakości – KUA); 30h/sem.; G. Makarewicz.

[Edu17] *Detection of Nuclear and Biomedical Signals* (Detekcja sygnałów biomedycznych i jądrowych – DSBJ); 60 h/sem.; J. Marzec.

[Edu18] *Digital Cellular Systems* (Cyfrowe systemy komórkowe – CSK); 45 h/sem.; J. Kołakowski.

[Edu19] *Digital Circuits* – EDC1; 30 h/sem.; P. Miazga (English-medium studies).

[Edu20] *Digital Communications* – EDICO; 60 h/sem.; P. Bilski (English-medium studies).

[Edu21] *Diploma Seminar for Graduate Students 1* (Seminarium dyplomowe magisterskie 1 – SDM1); 30 h/sem.; P. Brzeski, W. Gwarek, Z. Kulka, J. Marzec, J. Modelski.

[Edu22] *Diploma Seminar for Graduate Students 2* (Seminarium dyplomowe magisterskie 2 – SDM2); 30 h/sem.; P. Brzeski, W. Gwarek, Z. Kulka, J. Marzec, J. Modelski.

[Edu23] *Diploma Seminar for Undergraduate Students* (Seminarium dyplomowe inżynierskie – SDI); 30 h/sem.; P. Brzeski, W. Gwarek, J. Marzec, Y. Yashchyshyn, J. Żera.

[Edu24] *Digital Systems* (Układy cyfrowe – UCYF); 15 h/sem.; K. Mroczek, T. Olszewski, D. Rosołowski.

[Edu25] *Dc/dc Power Converters Supply* (Zasilanie układów elektronicznych - ZUE); 45 h/sem.; M. Mikołajewski.

[Edu26] *Event-Driven Programming* (Programowanie zdarzeniowe – PROZE); 45 h/sem.; K. Ignasiak.

[Edu27] *Ethical Aspects of Research and Engineering* – EEARE; 30 h/sem; R. Z. Morawski (English-medium studies).

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

[Edu29] *Influence of Electromagnetic Waves on Living Organisms* (Oddziaływanie fal elektromagnetycznych na organizmy żywe – OFE); 30 h/sem.; K. Derzakowski.

[Edu30] *Introduction to Numerical Methods* (Wstęp do metod numerycznych – WNUM); 45 h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski.

[Edu31] *Measurement Systems* (Systemy pomiarowe – SPOM); 30h/sem.; W. Winiecki.

[Edu32] *Medical Electronic Instrumentation* (Elektroniczna aparatura medyczna – EAME); 60 h/sem.; M. Dziewiecki, R. Szabatin, T. Jamrógiewicz, E. Piątkowska-Janko.

[Edu33] *Microwave Technique (*Technika mikrofalowa – TMO); 60 h/sem.; W. Wojtasiak.

[Edu34] *Multi-service and Multimedia Networks* – EMSMN; 60 h/sem.; T. Keller (English-medium studies).

[Edu35] *Musical Acoustics* (Akustyka muzyczna – AM); 30 h/sem.; J. Żera.

[Edu36] *Noise Control* (Ochrona przed hałasem – OPH); 30 h/sem.; E. Kotarbińska (for Faculty of Environmental Engineering).

[Edu37] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej – TMENU); 30 h/ sem.; R. Szabatin.

[Edu38] *Numerical Methods* (Metody numeryczne – MNUB); 45 h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski.

[Edu39] *Numerical Methods* – ENUME; 60 h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski (English-medium studies).

[Edu40] *Object-oriented Programming M* (Programowanie obiektowe M – PROE); 60 h/sem.; J. Naruniec.

[Edu41] *Object-oriented Programming of Multimedia Applications in Java (*Java – obiektowe programowanie aplikacji multimedialnych – OPA); 45 h/sem.; K. Ignasiak.

[Edu42] *Operating Systems* (Systemy operacyjne – SOE); 15h/sem.; M. Sypniewski.

[Edu43] *Orientation* (Orientacja – ORM); 15 h/sem.; J. Cichocki.

[Edu44] *Physics 2* – EPHY2; 60 h/sem.; B. Salski (English-medium studies).

[Edu45] *Programming Languages* (Języki programowania - JP); 75 h/sem.; W. Smolik.

[Edu46] *Radiocommunication Systems* (Systemy radiokomunikacyjne – SRKO); 45 h/sem.; T. Kosiło, K. Godziszewski.

[Edu47] *Radioelectronics Measurements (*Miernictwo radioelektroniczne – MR); 45 h/sem.; J. Cichocki.

[Edu48] *Radio Networks and Systems* (Systemy i sieci radiowe – SISR); 45 h/sem.; T. Keller, K. Godziszewski.

[Edu49] *Radiological Apparatus in Medical Diagnostics* (Aparatura radiologiczna w diagnostyce medycznej – ARDM); 30 h/sem.; G. Domański.

[Edu50] *Radiology and Nucleonics* (Radiologia z nukleoniką – RN); 45 h/sem.; K. Zaremba.

[Edu51] *Satellite Communications* (Łączność satelitarna – LS); 45 h/sem.; K. Kurek.

[Edu52] *Selected Problems of Modern Television* (Wybrane zagadnienia współczesnej telewizji – WZWT); 30 h/sem.; M. Rusin.

[Edu53] *Signals and Systems* (Sygnały i systemy – SYGSY); 60 h/sem.; K. Snopek.

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

[Edu55] *Simulations of Radioelectronics Circuits* (Symulacja układów radioelektronicznych – SUREL); 45 h/sem.; D. Gryglewski.

[Edu56] *Software for Medical Systems (*Oprogramowanie systemów medycznych – OSM); 45 h/sem.; R. Kurjata, T. Jamrógiewicz.

[Edu57] *Sound Recording Technique* (Dźwiękowa technika studyjna – DTS); 45 h/sem.; M. Lewandowski.

[Edu58] *Television Systems* (Systemy telewizyjne – SYTE); 45 h/sem.; A. Buchowicz, M. Rusin.

[Edu59] *Ultrasonography Instrumentation* (Aparatura ultrasonograficzna – AUS); 45 h/sem.; R. Jóźwiak.

[Edu60] *UMTS System (System UMTS – UMTS);* 45 h/sem.; J. Kołakowski.

[Edu61] *Visualization and Modeling in Multimedia* (wizualizacja i modelowanie w multimediach – WIM); 45h/sem.; W. Skarbek.

3.1.2 Advanced courses

[Edu62] *Adaptive Image Recognition* – EADIR; 60 h/sem.; W. Skarbek.

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

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

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

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

[Edu67] *Computional Electromagnetics for Telecommunications* – ECOET; 60 h/sem.; W. Gwarek, A. Więckowski (English-edium studies).

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

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

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

[Edu71] *Design of Radiocommunication Systems* (Projektowanie układów radiokomunikacyjnych – PSRD); 60 h/sem.; T. Kosiło.

[Edu72] *Design of SDR Systems* (Projektowanie systemów SDR – PSDR); 45h/sem.; D. Rosołowski.

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

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

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

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

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

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

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

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

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

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

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

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

[Edu85] *Mathematics in Multimedia* (Matematyka w multimediach – MATMU); 60 h/sem.; W. Skarbek.

[Edu86] *Methodological and Ethical Aspects of Research* – EMAR); 45 h/sem.; R. Z. Morawski.

[Edu87] *Modern Radio Transmission Techniques* (Nowe techniki transmisji radiowej – NTTR); 45 h/sem.; Y. Yashchyshyn, S. Kozłowski.

[Edu88] *Neural Networks in Biomedical Applications* (Sieci neuronowe w zastosowaniach biomedycznych – SNB); 45 h/sem., K. Zaremba.

[Edu89] *Noise and Electromagnetic Interference in Electronic Devices* (Szumy i zakłócenia w aparaturze elektronicznej – SZAE); 45 h/sem., J. Marzec.

[Edu90] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej – TMN); 60 h/sem.; R. Szabatin.

[Edu91] *Radiation Detection* (Detekcja promieniowania jonizującego – DEPJO); 30 h/sem.; J. Marzec.

[Edu92] *Radiological Equipment in Medical Diagnostics* (Aparatura radiologiczna w diagnostyce medycznej – ARDM); 30 h/sem.; G. Domański.

[Edu93] *Radio Localization and Identification Systems* (Radiowe systemy lokalizacji i identyfikacji – RADS); 45 h/sem.; P. Bajurko.

[Edu94] *Telemedical Systems* (Systemy telemedyczne - TELM); 45 h/sem., R. Kurjata.

[Edu95] *Ultrawideband Technologies* (Techniki ultraszerokopasmowe - TUSP); 45 h/sem., J. Kołakowski.

3.2. Special courses

3.2.1 Engineer Degree Evening Studies on Radiocommunications and Multimedia Technology

[Edu96] *Antennae* (Anteny – ANM); 30 h/sem.; semester 4; S. Rosłoniec.

[Edu97] *Basics of Computer Techniques* (Podstawy techniki komputerowej – PKOM); 45 h/sem.; semester 1; R. Kurjata.

[Edu98] *Basics of High-Frequency Techniques* (Podstawy techniki w.cz. – PTWM); 60 h/sem.; semester 3; D. Gryglewski.

[Edu99] *Basics of Logical Circuits and Microprocessor Technique* (Układy logiczne i podstawy techniki mikroprocesorowej – PULM); 60 h/sem.; semester 4; B. Konarzewski.

[Edu100] *Basics of Metrology* (Podstawy metrologii – PMEM); 45 h/sem.; semester 1; W. Winiecki.

[Edu101] *Basics of Satellite Communications* (Podstawy łączności satelitarnej – SATM); 15 h/sem.; semester 4; K. Kurek.

[Edu102] *Circuits and Signals* (Obwody i sygnały – OSRM); 45 h/sem.; semester 2; M. Dziewiecki.

[Edu103] *Computer Control and Data Processing* (Komputerowe sterowanie i przetwarzanie danych – KSTM); 45h/sem.; semester 4, W. Winiecki.

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

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

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

[Edu107] *Electronic Circuits* (Układy elektroniczne – UEM); 45h/sem.; semester 3; D. Gryglewski.

[Edu108] *Fields and Waves* (Pola i fale – PFM); 60 h/sem.; semester 2; D. Rosołowski.

[Edu109] *Internet Techniques* (Techniki Internetowe – TINM), 30 h/sem.; semester 7; K. Ignasiak.

[Edu110] *Introduction to Programming* (Wstęp do programowania – WPRM); 15h/sem.; semester 2; R. Kurjata.

[Edu111] *Materials and Elements* (Materiały i elementy – MEM); 15 h/sem.; semester 3; K. Radecki.

[Edu112] *Multimedia Applications* (Aplikacje multimedialne – AMRM); 30 h/sem.; semester 5; T. Rubel.

[Edu113] *Multimedia Computer Systems* (Multimedialne systemy komputerowe – MSKM); 30 h/sem.; semester 4; T. Jamrógiewicz.

[Edu114] *Multimedia Techniques* (Techniki Multimedialne – TMM); 30h/sem.; semester 6; G. Galiński.

[Edu115] *Numerical and Statistical Techniques* (Techniki obliczeniowe i symulacyjne – TOSM); 30 h/sem.; semester 4; A. Miękina.

[Edu116] *Programmable Digital Devices* (Programowalne układy cyfrowe – PUCM); 30 h/sem.; semester 5; M. Ziembicki.

[Edu117] *Programming* (Programowanie – PMRM); 30 h/sem.; semester 3; R. Kurjata.

[Edu118] *Project 1* (Projekt 1 – PJUM); 30 h/sem.; semester 5; J. Cichocki.

[Edu119] *Project 2* (Projekt 2 – PSRM); 60 h/sem.; semester 6; J. Cichocki.

[Edu120] *Radiodiffusion Systems* (Systemy radiodyfuzyjne – SRDM); 60 h/sem.; semester 6; A. Buchowicz, H. Chaciński.

[Edu121] *Radiocommunication Systems 1* (Systemy radiokomunikacyjne 1 – SRKM); 60 h/sem.; semester 6; T. Kosiło.

[Edu122] *Radiocommunication Systems 2* (Systemy radiokomunikacyjne 2 – SRK2M); 60 h/sem.; semester 7; T. Kosiło.

[Edu123] *Radioelectronics Measurements* (Miernictwo radioelektroniczne – MRM); 45h/sem.; semester 5; J. Cichocki.

[Edu124] *Rules of Industrial Property* (Prawa własności przemysłowej – PWPR); 15 h/sem.; semester 7; M. Bury.

[Edu125] *Signals and Modulations* (Sygnały i modulacje – SMRM); 60 h/sem.; semester 3; K. Snopek, K. Radecki.

[Edu126] *Sound Techniques* (Techniki dźwiękowe – TDRM); 30 h/sem.; semester 7; P. Bobiński.

[Edu127] *Technique of Emission and Receiving* (Technika emisji i odbioru – TEM); 45 h/sem.; semester 5; J. Modzelewski, W. Kazubski.

3.2.2. Environmental Noise Course

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

[Edu128] *Basics of Acoustics* (Podstawy akustyki); 25h; M. Tajchert, A. Leszczyński.

[Edu129] *Basics of Statistics* (Podstawy statystyki); 10h; M. Kirpluk.

[Edu130] *Environment Noise Prediction* (Prognozowanie emisji hałasu w środowisku); 10h; M. Kirpluk.

[Edu131] *Noise in the Workplace* (Hałas w środowisku pracy); 6h; E. Kotarbińska.

[Edu132] *Legal Environment Noise Regulations* (Regulacje prawne w zakresie ochrony środowiska przed hałasem); 4h; M. Wojciechowska.

[Edu133] *Noise Measuring and Monitoring Methods* (Metody pomiaru i monitorowania hałasu); 16h; M. Kirpluk, J. Maciejczyk, P. Tomczyk.

[Edu134] *Noise Control* (Zabezpieczenia akustyczne); 10h; J. Sikora, G. Makarewicz.

[Edu135] *Human Health Effects of Noise* (Wpływ hałasu na organizm ludzki); 4h; Z. Koszarny.

[Edu136] *Noise Mapping* (Mapy akustyczne); 6h; J. Grabowski.

[Edu137] *Research Laboratories Accreditation* (Akredytacja laboratoriów badawczych); 6h; M. Szeląg.

[Edu138] *Selected Problems in Building Acoustics* (Wybrane zagadnienia z akustyki budowlanej); 16h; M. Niemas.

[Edu139] *Uncertainty of Noise Measurements* (Niepewność pomiarów); 8h; M. Kirpluk.

[Edu140] *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)

[Edu141] *Basics of Sound Technique* (Podstawy techniki dźwiękowej); 30 h/sem.; Z. Kulka, M. Tajchert.

[Edu142] *Systems and Devices of Sound Technique* (Urządzenia i systemy techniki dźwiękowej); 30 h/sem.; Z. Kulka, M. Tajchert.

3.3. Educational projects

[Edu143] **International Master's Degree in multiMEDIA – Technology, Design, Management** (Studia II stopnia w języku angielskim: multimedia – technologie, projektowanie, zarządzanie)
Józef Modelski, W. Skarbek, J. Żera, P. Bobiński, A. Buchowicz, G. Galiński, K. Ignasiak, T. Kosiło;
Apr. 11, 2014 – Dec. 31, 2016
Foundation for the Development of the Education System, Norway Grants

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

3.4. International co-operation

Within the Advanced Technology Higher Education Network / Socrates (ATHENS), from March 16 to March 20, the course *"Ethical Aspects of Research and Engineering"* was given by **Roman Z. Morawski**, *"Sound Hearing and Acoustical Measurements"* was given by **Jan Żera f**rom November 14 to November 21 to a group of 30 students. The students who attended this course were from the following EU institutions of higher education:

- České Vysoké Učení Technické, Prague, Czech Republic (2 persons);
- École des Mines de Paris, Paris, France (4 persons);
- École Nationale Supérieure des Télécommunications, Paris, France (1 persons);
- École Supérieure de Physique et de Chimie Industrielle, Paris, France (2 persons);
- Instituto Superior Tecnica, Lisboa, Portugal (2 persons);
- İstanbul Teknik Üniversitesi, Istanbul, Turkey (2 persons);
- Katholieke Universiteit Leuven, Leuven, Belgium (9 persons);
- Politecnico di Milano, Milano, Italy (2 persons);
- Technische Universiteit Delft, Delft, The Netherlands (1 person);
- Universidad Politécnica de Madrid, Madrid, Spain (5 persons).

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

4. RESEARCH ACTIVITIES

4.1. International projects

4.1.1. European grants.

[Pro1] **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 was able to meet the today's most stringent Location Based Services (LBS) requirements in both outdoor and indoor situations. The envisaged PND exploited 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 was dedicated, but not limited, to situations where transitioning from indoor to outdoor were frequent and unavoidable such as: shopping malls, warehouses, large scale metropolitan events, ports and airports.

[Pro2] **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 was 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 adaptively changed parameters of the transmitted signal (modulation, channel code, bit rate) in order to maximize total amount of the data transmitted from satellite. The project was realized in cooperation with Space Research Centre PAS, Nicolaus Copernicus Astronomical Centre PAS and Astri Polska.

[Pro3] **Super-Kamiokande Plus**
Krzysztof Zaremba
M. Dziewiecki, M. Ziembicki, A. Rychter
Nov. 11, 2014 – Nov. 11, 2018
Horizon 2020, EU Framework Programme for Research and Innovation

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

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

4.2.1. International grants

[Pro4] **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 – Nov. 30, 2016
Funded by the National Science Center

The project was a part of the long-term collaboration between the Institute of Radioelectronics and Multimedia Technology, 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 and Multimedia Technology was 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 was also involved in preparations of the hardware upgrade of the COMPASS experiment for the new physical program.

[Pro5] **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 – Jun. 30, 2017
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.

[Pro6] **Properties of Neutrinos and Decay of Protons in Large Liquid Argon T600 Detector for ICARUS Experiment** (Własności neutrin i rozpady protonu – badania przy użyciu wielkiego ciekło-argonowego detektora T600 eksperymentu ICARUS).
Krzysztof Zaremba, P. Płoński;
HARMONIA, International project realized in collaboration with the Andrzej Soltan Institute for Nuclear Studies, the Henryk Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences, Silesian University;
Dec. 21, 2012 – Dec. 20, 2016
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.

[Pro7] **Care Support for Elderly and Disabled People by Radar Sensor Technology** (Wsparcie dla osób starszych i niepełnosprawnych poprzez technologię czujnika radarowego).
Wiesław Winiecki, R. Z. Morawski, Y. Yashchyshyn, K. Derzakowski, R. Łukaszewski, A. Miękina, P. Bajurko, K. Godziszewski;
RADCARE, Polish-Norwegian international project realized in collaboration with Bergen University College, Norway
May 1, 2013 – Apr. 30, 2016
Funded by the National Centre for Research and Development

The primary objective of this project is to examine new applications of impulse radar technology in preventive care and diagnostics of various health conditions. The investigated technique for supervision of human beings is an alternative to the techniques based on visual cameras and wearable devices. It enables non-invasive measurements of both human body movements and selected bodily functions. Its applicability and usefulness in the nursing homes will be examined, and corresponding prototype solutions will be developed.

[Pro8] **Networked Infrastructure for Innovative Home Care Solutions** (Infrastruktura sieciowa dla innowacyjnych rozwiązań w obszarze opieki domowej).
Jerzy Kołakowski, R. Michnowski, K. Radecki, J. Cichocki, A. Badawika, V. Djaja-Jośko;
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 was to develop an integrated platform that enabled 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.

[Pro9] **Self-Navigated Integrin Receptors Seeking "Thermally-Smart" Multifunctional Few-Layer Grahene-Encapsulated Magnetic Nanoparticles for Molecular MRI-Guided Anticancer Treatments in "Real Time" Personalized Nanomedicine** (Samonaprowadzające na receptory integrynowe "termicznie-rektywne" wielofunkcyjne nanocząstki magnetyczne enkapsułowane w kilku warstwach grafenu w molekularnym obrazowaniu MR przeciwnowotworowej terapii opartej na personalizowanej nanomedycynie "czasu rzeczywistego").
Piotr Bogorodzki, E. Piątkowska-Janko, B. Kossowski, J. Orzeł;
Aug. 03, 2015 – Feb. 28, 2018
GEMNS, FP7 ERA-NET EuroNanoMed II

The GEMNS project is realized in collaboration between the Warsaw University of Technology, Medical University of Warsaw, University of Warsaw, University of Bergen, Babes-Bolyai University of Cluj, NILU Norwegian Institute for Air Research, Sciencepharma Ltd. The project is designed to develop novel, thermally "smart", multifunctional, multi-layered graphene-encapsulated magnetic nanoparticles (GEMNS) for molecular MR imaging (mMRI) and anticancer treatments. The theranostic GEMNS will be bioengineered with self-assembled polymeric nano-gels and decorated with antibodies that recognize; certain integrin receptors on lung cancer tissues and identify new cancer vessels. A chosen enzyme will be absorbed onto the GEMNS and releases in a controllable and fully predictable manner in order to promote anticancer activity. The release of the enzyme triggers "on-off" hypoxia states at the molecular level in lung cancer cells and tissues. After several courses of such enzymatic-based molecular pre-sensing, mMRI-guided targeted X-ray radiotherapy will be applied to target lung cancer in preclinical animal models. A new nanosafety paradigm for the PRE-FIM strategy will also be developed using comprehensive QSAR, microfluidic, and genetic/epigenetic approaches to characterize the GEMNS theranostic contrast/drug candidates compliant with regulatory requirements.

4.2.2. Grants for Young Researchers

[Pro10] **Hybrid Modeling of a Laser Action with the Finite Difference Time Domain Method** (Modelowanie hybrydowe zjawiska akcji laserowej w oparciu o metodę różnic skończonych w dziedzinie czasu).
Bartłomiej Salski;
Jun. 19, 2013 – Jun. 18, 2015
Iuventus Plus Programme

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

[Pro11] **Linearization Methods of Microwave Pulse Power Amplifiers** (Opracowanie metod linearyzacji mikrofalowych impulsowych wzmacniaczy mocy).
Tomasz Filipek;
May 01, 2013 – Jan. 31, 2015
Ventures Programme
Funded by the Foundation for Polish Science, cofinanced from EU, Regional Development Fund.

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

4.2.3. Research grants

[Pro12] **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, P. Kopyt.
OPUS project
Mar. 01, 2013 – Feb. 28, 2017
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.

[Pro13] **Graphene Pastes and Inks for Printing Conductive Paths and Layers for Document Protection** (Grafenowe pasty i atramenty do drukowania ścieżek i warstw przewodzących w zastosowaniu do zabezpieczenia dokumentów GRAFINKS).
Wojciech Gwarek, B. Salski, P. Kopyt, M. Olszewska-Placha;
Jun. 01, 2013 – Dec. 31, 2015
GRAF-TECH
Funded by National Centre for Research and Development

The aim of the project was to elaborate graphene pastes and inks compositions and technology. Graphene were 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 was 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 and Multimedia Technology (Faculty of Electronics and Information Technology, WUT) and the Polish Security Printing Works as an industrial partner.

[Pro14] **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.

[Pro15] **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, D. Rosołowski, D. Gryglewski, W. Gwarek.
Dec. 07, 2012 – Oct. 31, 2015
Funded by the National Centre for Research and Development

This project was 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 was 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 were fabricated by ammonothermal method and their size scaled for 1” to 1.5”. Two techniques - MOVPE and MBE were 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 was 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 were optimised including the definition of the active device area, RIE/ICP etching for ohmic contacts and gate recessing, through-wafer via holes fabrication.

[Pro16] **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 was 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 was a MOS transistor with a planar antenna responsible for ensuring frequency selectivity of the complete device. A pixel has contained also a low--noise integrated amplifier. It was planned that the detector w consist of 10 – 15 such pixels. The device realized as a project result would 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 became 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 were to be performed.

[Pro17] **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, P. Olszyna;
NIALMON
Nov. 01, 2013 – Sept. 30, 2016
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.

[Pro18] **Wideband Radiocommunication Recorder** (Szerokopasmowy rejestrator radiokomunikacyjny).
Józef Modelski, W. Wojtasiak, D. Rosołowski, P. Korpas, T. Kosiło, K. Snopek, D. Gryglewski;
Dec. 20, 2013 – Dec. 19, 2016
Funded by the National Centre for Research and Development

The project is carried out at studies on the implementation of the broadband receiver provided the use of components with the best possible performance (linearity, dynamics processing) allowed by the current technological advances. were tested devices designed for broadband collection and analysis of signals in the range of UHF / SHF and important aspects of the design of the processing of A / C. The result of the work will be to develop a broadband radio communications recorder using the OIF and superheterodyne architecture with digital second intermediate.

[Pro19] **Development of Integrated Functional Block for Millimeter-Waves Applications Realized in the LTCC Technology** (Rozwój zintegrowanych bloków funkcjonalnych dla aplikacji na fale milimetrowe realizowanych w technologii LTCC).
Yevhen Yashchyshyn, P. Bajurko, K. Derzakowski, S. Kozłowski, K. Godziszewski, P. Piasecki;
Sept. 01, 2015 – Aug. 31. 2018
Funded by the National Centre for Research and Development

The aim of the project is to develop design methods for implementation and integration of millimeter-wave systems realized in the LTCC (Low Temperature Co-fired Ceramic) technology. Several building blocks of wireless millimeter-wave systems operating in the frequency band between 20 and 140 GHz will be developed: novel antennas and antenna-arrays, transmission lines, passive elements (e.g. couplers, filters). A variety of interconnect techniques (e.g. wire-bonding) between the chip and the planar transmission lines will be analyzed, including matching structures. The goal of the project is to achieve a level of technical maturity of impelementation and integration of functional blocks allowing an industrial impelementation. The results of the planned research will significantly improve capabilities of Polish microelectronics industry and academia in the area of design and manufacturing of modern millimeter-waves systems.

[Pro20] **Sub-THz Active 3D Scanner for Counterterrorism Purposes** (Aktywny sub-THz skaner 3D do zastosowań antyterrorystycznych).
Yevhen Yashchyshyn, P. Bajurko, K. Derzakowski, S. Kozłowski, G. Bogdan;
Sept. 01, 2015 – Aug. 31. 2018
Funded by the National Centre for Research and Development

The aim of the project is to develop a demonstrator security scanner operating at sub-THz band for remote detection of dangerous objects carried by potential terrorists. The planned device will be a multi-pixel active multi-static radar, built on silicon chips operating at a frequency of 120 GHz. Planned demonstrator system parameters are far beyond the current state of knowledge and techniques of the world. These parameters will be achieved through innovative solutions of its individual components. The project will implement consortium consisting of leading Polish technical universities and research institutes, and the new Polish company (start-up) operating in the field of advanced microelectronic technologies. This cooperation will enable the efficient transfer of knowledge between universities and entrepreneurs.

[Pro21] **Full-Wave Electromagnetic Modeling of Coherent Radiation in Electrically-Pumped Metal-Clad Semiconductor Micro-Lasers with a Folded Metallic Resonator** (Pełnofalowe modelowanie elektromagnetyczne zjawiska generacji promieniowania koherentnego w pompowanych elektrycznie laserach półprzewodnikowych z metalizowanym rezonatorem składanym).
Bartłomiej Salski, P. Kopyt, M. Krysicki;
Sept. 16, 2015 –Sept. 15, 2018
SONATA Programme
Funded by the National Science Center

The main goal of the project will be the research on a complete time-domain computational model of coherent radiation in electrically-pumped metal-clad semiconductor micro-lasers with a folded cavity. The model will account for the drift and diffusion of carriers, rate equations representing active material, and Maxwell curl equations solving radiation of generated electromagnetic fields. Coupling of all those phenomena in one computational algorithm will be the novelty when compared to alternative solutions known in literature. The elaborated method will be applied to the research on a new type of metal-clad semiconductor lasers with a prism-like folded micro-cavity.

[Pro22] **Electromagnetic Method of Estimating the Degree of Penetration in the Process of Proppant Fracturing** (Metoda elektromagnetyczna estymacji stopnia penetracji propantu w procesie szczelinowania).
P. Miazga;
EMPROP, Blue Gas Program
Dec. 01, 2014 – Nov. 30, 2017
Funded by the National Centre for Research and Development

The project is aimed at verification of using magnetic proppants for characterization of propped fractures which resulted from hydraulic fracturing. The idea is to perform magnetotelluric (MT) measurements on various stage of this process. The project will verify if the magnetic proppant will change the measurements in such way that the differential image will provide information about the volume or dimensions fractures. The project is carried out at PGNiG, AGH University of Science and Technology, Gdańsk University of Technology, the Institut of Electronic Systems, WUT, the Institute of Ceramics and Building Materials. The project will involve interdisciplinary research in geophysics, materials science, electronics and information science. Expected major outputs of the project are: software tools for simulaton of subsurface electromagnetic wave propagation, software tools and methods of reduction and enhancement of MT measurements resolution, empirical verification of the method in Poland's conditions.

[Pro23] **Methods of Protection and Defense Against the HPM Impulses** (Metody i sposoby ochrony i obrony przed impulsami HPM).
Paweł Kopyt
Dec. 31, 2014 – Dec. 29, 2020
Funded by the National Centre for Research and Development

The project is elaborated in the co-operation with the Military University of Technology, Wroclaw University of Technology, PIT – Radwar Stock Company, Radio Marketing Ltd., the Air Force Institute of Technology, and Pol-Spec-Tech-Service Company. In the frame of the project it is planned to conduct research on the development of methods and means of protection and defense equipment, military equipment and facilities from the destructive effects of HPM pulses particularly, in terms of security of communication equipment, radar equipment, and manned and unmanned facilities and platforms. The project involves testing the impact of the biological effects of HPM pulses of high-frequency and low-frequency microwave. As a result of this work, the main objective of the project is to develop absorbers for different frequency ranges, in different forms and consistencies depending on the needs developed to protect and defend against HPM pulses. The first stage is to take place in the form of technology demonstrators, and in the second stage, in the context of development work is assumed to develop their prototypes, programs and methodologies qualification tests. Design qualification tests are complete absorbers, to develop methods and ways to protect and defend, develop medical instructions concerning medical effects of HPM pulses, Norm Defence for absorbers, as well as user security communication equipment, radar equipment, and manned and unmanned facilities and platforms

4.2.4. Ph.D. grants

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

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

4.3 Projects granted by the University

4.3.1 Statutory projects

[Pro25] **Techniques for Modeling the Electromagnetic and Thermodynamic and Design of Microwave and Optoelectronics Circuits** (Techniki modelowania elektromagnetycznego i termodynamicznego oraz projektowania układów mikrofalowych i optoelektronicznych).
Wojciech Gwarek, T. Morawski, S. Rosłoniec, M. Celuch, D. Gryglewski, P. Kopyt, P. Miazga, M. Sypniewski, A. Więckowski, W. Wojtasiak, D. Rosołowski, B. Salski, P. Kończak, M. Olszewska-Placha, M. Lubiejewski;
Jun 01, 2014 – Nov. 30, 2015

The presented project included methods of analysis and design of circuits destined for microwave and optoelectronic circuits. An important course of action was to incorporate the work on a complete time-domain computational model of coherent radiation in electrically-pumped metal-clad semiconductor micro-lasers with a folded cavity. Within the statutory project framework measurements of spectra important in the areas of biology, medicine and security were to be performed. As part of the work it was carried out studies of the modernization of the Polish industry radar. The work on modeling of quasi-THz detection on MOS transistors junctions was scheduled for continuation.

[Pro26] **Audiovisual Network Hybrid Systems** (Audiowizualne sieciowe systemy hybrydowe).
Krystian Ignasiak, W. Skarbek, G. Pastuszak A. Buchowicz, G. Galiński, J. Naruniec, M. Jakubowski, M. Jędryka, M. Leszczyński, A. Nowakowski, A. Abramowski,

G. Brzuchalski, M. Roszkowski, M. Wieczorek;
Jun. 01, 2014 – Nov. 30, 2015

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

[Pro27] **Investigation of Distance Measurements Functions in UWB Radio Networks** (Badania funkcji określania odległości z wykorzystaniem ultraszerokopasmowych sieci radiowych).
Jerzy Kołakowski, J. Cichocki, R. Michnowski, K. Radecki, W. Kiełek, S. Żmudzin, A. Badawika, V. Djaja-Jośko;
Jun. 01, 2014 – Nov. 30, 2015

The project consisted in investigation of distance measurement functions included in UWB radio networks. The project started with analysis of the distance measurement functions included in latest UWB standards: IEEE802.15.4a, IEEE802.15.4f and WiMedia. Experimental part of the project depended on investigation of DecaWave's DW1000 chip features and tests of DW1000 based radio links. Obtained results confirmed that it is possible to achieve distance measurement accuracy in the order of several centimeters with a few centimeter precision. Results of measurements proved that DW1000 based IEEE802.15.4a implementations can be successfully used for determination of distance between network nodes or even for nodes localization in positioning systems.

[Pro28] **Analysis of Applicability of Multi-Frequency in Satellite Communication** (Analiza możliwości zastosowania modulacji wielocz̨estotliwościowych w łączności satelitarnej).
Józef Modelski, K. Kurek, T. Keller, M. Dąbrowski, M. Darmetko, K. Derzakowski;
Jun. 01, 2014 – Nov. 30, 2015

The main aim of the statutory work was to analyze the methods used in techniques based on OFDM and MC-CDMA. The project resulted in the development of OFDM system in MATLAB, but simulation analysis was conducted only a basic level. The performed measurements showed that the developed can be used for SDR program implementation in FPGA.

[Pro29] **Analysis, Design methods, and Circuit Improvement of Switch-Mode Class-E Amplifiers and Wideband 3-30 MHz Linear Power Amplifiers** (Doskonalenie układów, analiza i metody projektowania przełącznikowych wzmacniaczy mocy klasy E i liniowych wzmacniaczy mocy na zakres 3-30 MHz).
Juliusz Modzelewski, H. Chaciński, W. Kazubski, T. Kosiło, M. Mikołajewski;

The research project included theoretical analyses and their experimental verification for 50W/300 kHz high-efficiency Class E transformer amplifiers as well as wideband push-pull 100 W linear Class AB amplifiers operating in the short-wave range (3-30 MHz).
The Class E amplifier with an isolation and impedance matching transformer in the resonant circuit was analyzed for any duty cycle of the switch current taking into account leakage inductances of the transformer windings. The analysis proved that by adjusting the duty cycle of the switch current it is possible to optimize the amplifier parameters with respect to the parameters of the applied transistor switch. Obtained analytical relations were applied in the proposed design procedure which was verified experimentally by designing and building three Class E amplifiers (50 W, 300 kHz) with the same transformer and three different duty cycles of the switch current D=0.4, 0.5, and 0.6.
An analysis of problems in designing and building linear Class AB push-pull amplifiers for the short-wave range (3-30 MHz) was also given. It was shown that the best properties of these amplifiers were obtained if the input transformer as well as the output transformer were made as transmission-line transformers with a matched transmission cable wound on a ferrite core. The influence of the input and output capacitances of the power transistors on the amplifier frequency response can be reduced by including the capacitances into the low-pass filters with the flat frequency response in the required band. The analysis results were used to design and build the linear 100 W wideband 3-30 MHz amplifier. The built amplifier operated in the required frequency range with good linearity and acceptable efficiency

[Pro30] **Methodological and Meta-Metrological Aspects of Measurement Data Processing** (Metodologiczne i metametrologiczne aspekty przetwarzania danych pomiarowych).
Roman Z. Morawski, A. Miękina, A. Podgórski;
Jun. 01, 2014 – Nov. 30, 2015

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 analysis of the research organisation at the national and international level. The results of the

research accomplished have been partially published in two journal papers and in two book chapters.

[Pro31] **Research in the Field of Signals and Networks** (Badania w zakresie sygnałów i sieci).
Kajetana Snopek, S. Kozłowski, A. Bilski, Ł. Błaszczyk;
Jun. 01, 2014 – Nov. 30 2015

The subject matter of the research is focused on three fields: theory and applications of hypercomplex signals, SDR systems design and graph and network structure analysis. The available references have been analysed and further research areas have been indicated. A new watermarking algorithm with quaternions has been proposed. The properties of the Octonion Fourier transformation have been studied and the theory of compressed sensing for n-dimensional quaternion signals has been reformulated. The real-time signal processing algorithms in a receiver composed of a SDR module and a PC have been optimized. The work is documented with numerous publications of the research team.

[Pro32] **Analysis of the Methods for the Electrical Appliances Identification in the Systems of the Energy Consumption Monitoring** (Analiza metod identyfikacji odbiorników w systemach monitorowania zużycia energii elektrycznej).
Wiesław Winiecki, P. Bilski, R. Łukaszewski, K. Mroczek, A. Wójcik, P. Zawistowski;
Jun. 01, 2014 – Nov. 30, 2015

The task involved legal stipulations of implementing the intelligent measurement systems in the power engineering. The measurement infrastructure evolution was discussed. The new fundamental concepts, illustrating changes in the modern energetics, such as Smart Grid, Smart Metering, AMI, HAS or Smart Meter were introduced. The idea of the modern telecommunication system for the relay network management was presented. Finally, the home energy consumption monitoring systems were considered, including the non-intrusive load monitoring systems in the home infrastructure.
Applications of selected artificial intelligence methods to the diagnostics of analog systems were examined. The most significant results were obtained for the random forest, identifying faults in the electronic circuits.
Similarly, optimization approaches to solve selected problems in the diagnostics of analog systems were implemented and verified.
The versatile interface was constructed for the communication between the data acquisition (DAQ) application and the USB using the FPGA circuit (the system controller) and the USB FIFO circuit (to implement the USB protocol). The designed FIFO USB DAQ IP-core circuit can be connected to the digital part of the DAQ application using the simple I/O subsystem.
Tasks regarding problems of ensuring security to the distributed measurement systems were continued. The selected symmetric cryptography algorithms were implemented in the distributed measurement systems.

[Pro33] **Investigation of the Influence of Imperfections in Multilayer Structures on the Accuracy of Material Characterization** (Badania wpływu niedoskonałości wykonania struktur wielowarstwowych na dokładność charakteryzacji materiałów).
Yevhen Yashchyshyn, P. Bajurko K. Derzakowski, A. Łysiuk, K. Godziszewski, G. Bogdan, P. Piasecki;
Jun. 01, 2014 – Nov. 30, 2015

The aim of the project was to determine the influence of different types of imperfections in multilayer structures on the accuracy of material characterization. Few technological aspects were taken into account, including influence of metallization thickness and the presence of air gaps between particular layers, which can occur as a result of fabrication of multilayer structures. Appropriate simulation analysis and experimental verification were performed. Additionally, measurement setup and extraction methods of material parameters from raw measurement data were developed.

[Pro34] **Modern Techniques in Nuclear and Medical Electronics** (Nowoczesne techniki elektroniki jądrowej i medycznej).
Krzysztof Zaremba, P. Bogorodzki, P. Brzeski, G. Domański, M. Dziewiecki, T. Jamrógiewicz, B. Konarzewski, R. Kurjata, J. Marzec, T. Olszewski, E. Piątkowska-Janko, D. Radomski, B. Sawionek, W. Smolik, R. Szabatin, M. Ziembicki, W. Gradkowski, B. Kossowski, J. Kryszyn, W. Obrębski, J. Orzeł. A. Rychter, K. Werys, P. Wróblewski, M. Wieteska, M. Szczepankowski, P. Tor;
Jun. 01, 2014 – Nov. 30, 2015

Development of the volume coil type 'coupled rings' for the low field MRI-Picker

The aim of the study was the development a human head size transmitting and receiving volume coil for low field 0.23 T MRI scanner (Outlook ProView, Philips) under the control of an additional console (Kea2, Magritek).
As part of the work was performed:

- analysis of existing solutions
- sets out requirements for the coil
- selected components, modeled and optimized structure for the given parameters
- the tests of developed coil were performed

Analysis of ECG signal amplifier cooperating with dry electrodes

The issue of the construction of the ECG signal amplifier cooperating with dry electrodes is a major challenge for long-term monitoring of cardiovascular patients with heart disease. The use of wet electrodes is only possible within a short time, usually not exceeding one day. The task was carried out analysis of the ECG signal amplifier circuit cooperating with dry electrodes. The results of this analyss will be used in the future to develop a system for long-term ECG heart rate monitoring.

Electrical tomography technique in medicine and industry

This year, work on the subtopic of statutory task – electrical tomography techniques in medicine and industry – focused on the following tasks:

- development of embedded software (firmware) for electrical capacitance tomograph EVT4
- research on magnetic nanoparticles tomography

Task no. 1 was a continuation of work on the construction of multi-channel electrical capacitance tomograph EVT4 for dynamic imaging. In the context of previous work the following modules were developed and produced: analog measurement boards, read-out boards and the master control board. The boards were designed using digital programmable devices Xilinx Spartan 6 and microcontroller ARM Cortex-8. In this task, the work began on the system firmware. The VHDL code was elaborated for Spartan 6 installed on the readout boards. The code in machine language for soft PicoBlaze processors was implemented. The distributed automation which control a measurement cycle was created in this way. The VHDL code was developed for data transmission between the readout boards and the control board. Linux system driver for realizing the interface between Spartan 6 and processor ARM Cortex-8 was written in C language. The server for Linux system was also developed which provides the communication to the main computer of the tomographic system. In the framework of task no. 2, work continued on magnetic particle tomography – MPI. Built by our group first elements of the model of small MPI scanner allowing the reception of small samples were used in the measurements. Measurements of signal samples of solution FeraSpin M with nanoparticles size of 30-40 nm and fera Spin XL with nanoparticles with a size of 50-60 nm were carried out. Analysis of these measurements allows evaluating the performance of the scanner, and also the possibility of using existing measurement system as a spectrometer of magnetic particles. Model of the new lock-in amplifier, whose parameters will allow measuring a spectrum of magnetic nanoparticles, was selected.

[Pro35] **Design and Analysis of Electroacoustic and Sound Quality Assessment Systems** (Projektowanie i badania systemów elektroakustycznych oraz systemów oceny jakości dźwięku)
Jan Żera, Z. Kulka, P. Bobiński, E. Kotarbińska, G. Makarewicz, M. Lewandowski;
Jun. 01, 2014– Nov. 30, 2015

The project consisted of three independent research and construction topics. The first part was devoted to design and construction of an omnidirectional sound source intended for the use in room-acoustics measurements. The source is of comparable performance but is smaller and lighter than commercially available 12-speaker sources used for reverberation time measurements and measurements of sound insulation in rooms. The second part of the project was dedicated to active filters employed in parametric and graphic equalizers. It comprised numerical simulations, design, construction, measurements, and listening tests of devices developed in the laboratory. The third part was devoted to experimental verification of sharpness, roughness and fluctuation strength models. Listening tests were conducted which were used to re-check the old experimental data and numerical models developed for calculation of respective metrics. Results showed large variability among listeners.

4.3.2. Projects granted by the Rector

[Pro36] **Scintillation Detector with Matrix of Avalanche Photodiodes for the Detection of Ionizing Radiation in Biomedical Applications** (Detektor scyntylacyjny z matrycą fotodiod lawinowych do rejestracji promieniowania jonizującego w zastosowaniach biomedycznych).
Grzegorz Domański, J. Majdecki, Sz. Czupryński, B. Gruszka, M. Dwojak;
May 27, 2015 – Dec. 31, 2015

The scintillation detectors are widely used in medical imaging apparatuses using X-rays and gamma rays. In some cases, it is necessary to work in pulsed mode, in which a detector allows registration of radiation energy. An example of such a device may be, for example, a scinticamera. A typical light detector – a photomultiplier - receives the optical signal from a scintillator. It combines the function of a light detector and signal amplifier. These are vacuum tubes with complex mechanical design, whose production process is difficult to automation.
A significant breakthrough occurred when developing the concept miltipixel avalanche photodiode. The multipixel photodiode is the matrix of elementary avalanche photodiodes operating in a Geiger mode - each element of the array has a quenching resistor connected in series. The aim of the project was to construct a scintillation detector with CsI crystal matrix using 4 or 9 multipixel avalanche photodiodes (2x2 or 3x3) intended for recording X-rays and gamma rays.

4.3.3. Projects granted by the Dean

[Pro37] **Implementation and Testing of a Radio System using Time Modulated Antenna Arrays and a Module of Software Defined Radio** (Realizacja i badanie systemu radiowego wykorzystującego szyki antenowe z modulacją czasową i moduł radia programowalnego).
Rafał Bajurko;
May 30, 2014 – Mar. 31, 2015

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

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

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

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

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

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

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

[Pro41] **Photomultiplier Testing under Controlled Magnetic Field** (Badanie fotopowielaczy w warunkach kontrolowanego pola magnetycznego).
Michał Dziewiecki;
May 22, 2015 – Dec. 31, 2015

The goal of the project was to create measurement set and subsequent measurements of the parameters of the photomultipliers, such as gain, photon detection efficiency, dark count rate, pixel-to pixel crosstalk and afterpulsing.

4.4 Other projects

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

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

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

The research project assumed creation of two measurement platforms; a set of multiphase flow system and a mini production line. In the first case two-phase flows of liquid (water) and air were analysed. The type of flow was commonly used in chemical reactors where air was mixing substances. In the second case was analyzing moving objects on the mini production line using RFID tags and image detection techniques.

[Pro44] **Distributed System for Concrete Curing Temperature Measurement** (Rozproszony system do pomiaru temperatury tężejącego betonu).
Jerzy Kołakowski, J. Cichocki, R. Michnowski;
Jul. 01, 2015 – Dec. 15, 2015
Funded by MOSTOSTAL Warszawa

The development system is intended for outdoor measurements of concrete temperatures, ambient temperature and humidity.

[Pro45] **Hybrid CT Scanner to Examine Buildings Moisture and Condition** (Tomograf hybrydowy do badania zawilgocenia i stanu budynków).
Waldemar Smolik, P. Brzeski, J. Kryszyn, T. Olszewski, R. Szabatin;
Oct. 01, 2015 – Feb. 28, 2018
Funded by Netrix S.A.

The project is carried out at Netrix S.A. Research and Development Centre in Lublin. The objective is to build a multimodal electrical tomograph which enables measurement of conductivity and permittivity spatial distribution. The new image reconstruction methods are also developed. The device will be used for imaging of dumped wall.

[Pro46] **Measurements of the Operation of a Microwave Applicator for Thermal Treatment of Longitudinal Cracks in Bituminous Surfaces** (Pomiary parametrów pracy ampliratora mikrofalowego do spajania szczelin technologicznych w nawierzchniach bitumicznych).
Bartłomiej Salski, T. Karpisz.
Oct. 17, 2014 – Mar. 17, 2015
Funded by Qwed sp.z.o.o.

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

[Pro47] **Designing of the Antennas for THz HBT Radiation Detectors at InP Surface** (Projekt anten na potrzeby detektorów promieniowania THz na tranzystorach HBT wytwarzanych na podłożu InP).
Paweł Kopyt
Feb. 25, 2015 – Mar. 25, 2015
Funded by HFT Opto sp. z. o.o.

The main goal of this project was to elaborate, construct and verify the antennas connected to THz radiation detectors supported with HBT transistors at InP surface. Designed antennas were worked in frequency range: 265-375, and 640-690 GHz. The solutions included bow-tie antennas, logarithmic--periodic antennas and printed dipoles.

[Pro48] **Specular Reflectivity Measurements of Electromagnetic Absorber Materials** (Pomiary współczynnika odbić zwierciadlanych od elektromagnetycznych materiałów pochłaniających).
Paweł Bajurko
Mar. 20, 2015 – May 31, 2015
Funded by E&C Anechoic Chambers N.V., Belgium

The main aim of this work were the measurements of electromagnetic absorber materials within the frequency range of 75-110 GHz and 325-500 GHz.

[Pro49] **Development of Device Operating in a Magnetic Field of 3T Scanner for Delivering Small Quantities of Liquid Substances with the Dedicated Functional Studies** (Opracowanie urządzenia, działającego w polu magnetycznym skanera 3T służącego do podawania niewielkich ilości płynnych substancji wraz z opracowaniem schematu dedykowanych badań czynnościowych).
Piotr Bogorodzki, E. Piątkowska-Janko, B. Kossowski, J. Orzeł.
Oct. 07, 2015 – Jan. 31, 2016
Funded by Instytut Biologii Doświadczalnej im. M. Nenckiego (Nencki Institute of Experimental Biology).

The main goal of this project was to construct the instrumentation for medical investigations. The project is a part of the preclinical researches undertaking in the Nencki Institute of Experimental Biology.

4.5 Other activities

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

Bartłomiej Salski;
Oct. 07, 2015-Oct. 07, 2018

The scholarship recipient research interests focused on the electromagnetic modelling. The main aim is to detect defects in composite materials and components.

4.5.2 Partnership

4.5.2.1 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 Electroacoustics Division
Jan Żera – co-ordinator
Oct. 1, 2013 – Aug. 1, 2015

The purpose of the project was 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 has sought 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 has been 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.

4.5.2.2 International Co-operation

CC-Link

Since 12 May 2005 the Institute of Radioelectronics and Multimedia Technology 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.

4.5.3.3. National Co-operation

MultiShow Cluster

The Institute of Radioelectronics and Multimedia Technology 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 and Multimedia Technology, 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.

Intelligent Transport

The new established science and technology platform is carried out at Faculty of Electronics and Information Technology (Institute of Radioelectronics and Multimedia Technology, Institute of Telecommunications), Faculty of Transport, Faculty of Administration and Social Sciences, Faculty of Automotive and Construction Machinery Engineering. The main aim of this project is to realize the scientific researches in the field of telecommunication and information systems and methods of information in an intelligent transport.

4.5.3 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 research groups: from the Institute of Electronics Systems and from Institute of Radioelectronics and Multimedia Technology – 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 and Multimedia Technology (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

4.5.4 Student research groups

Space Engineering Student Scientific Group
Krzysztof Kurek – tutor.

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

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

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

Innovative Information Technologies Student Scientific Group
Przemysław Miazga – tutor.

The scope of interest of the Students' Circle for Innovative Informatics Technologies (KNITI) is the application of .NET technologies in mobile devices programming. In 2014 KNITI organized 3 courses for students of our university, two courses on basics of C# programming language (12 presentations x 2 hours each) and one course on advanced Windows 8 programming for mobile devices (10 x 2 hours) with over 250 participants. Students of the Group participated in many programming events and contests eg. in Microsoft Imagine Cup, hackatone Night of The Living Devs. The Circle is the organizer of K-Night LAN Party programming marathon.

MuGEd Student Scientific Group
Władysław Skarbek – tutor.

The aim of the group is a modern approach to teaching and learning processes by using many kinds of Multimedia in Educational Games (MuGEd). This objective relates to such topics as computer

graphics, artificial intelligence, and machine vision. Also, our projects are consulted with experts from other fields such as psychology and pedagogy. There is a feeling in the group, that the future belongs to mobile systems, hence the MuGEd works are dedicated to portable devices. The new vision of educational games, creating software for mobile systems and huge interdisciplinary of the work are the hallmarks of our Group

4.6 Instrumentation investments

4.6.1 Centre for Biomedical Technology and Medical Physics

Nuclear and Medical Electronics Division (**Krzysztof Zaremba** – head)
2008 - 2015
Founded by European Regional Develop-ment 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.

4.6.2 Sub-terahertz Technology and Antenna Laboratory

Yevhen Yashchyshyn, P. Bajurko
2010 – 2015
Founded by European Regional Develop-ment 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 system.

5. TITLES AND DEGREES AWARDED

5.1. D.Sc. Degrees

[DSc1] Grzegorz Pastuszak: *„Algorytmy i architektury koderów sprzętowych w kompresji danych wizyjnych w czasie rzeczywistym”* (Algorithms and architecture of hardware codec in vision data compression in a real time), Warsaw, Sept. 22, 2015.

[DSc2] Bartłomiej Salski: *“Modelowanie elektromagnetyczne i charakteryzacja własności dyspersyjnych materiałów oraz struktur”* (Electromagnetic modeling and dispersion properties of materials and structures), Warsaw, Mar. 24, 2015.

[DSc3] Wojciech Wojtasiak: *„Nowe rozwiązania układowe i konstrukcyjne mikrofalowych modułów nadawczych i odbiorczych specjalnego przeznaczenia”* (The new system and designing solutions of special microwave transmitters and receivers), Warsaw, Apr. 21, 2015.

5.2 Ph.D. Degrees

[PhD1] Grzegorz Brzuchalski: *“Optymalizacja algorytmów kwantyzacji w kodowaniu dźwięku”* (Optimization of the quantization algorithms in audio coding), Prof. **W. Skarbek** (supervisor), Warsaw, Nov. 3, 2015.

[PhD2] Przemysław Korpas: *“Nowe rozwiązania sprzętowe i algorytmy obliczeniowe wspomagające bezkontaktowy pomiar rezystywności materiałów półprzewodnikowych i dielektrycznych”* (New hardware solutions and computational algorithms to support non-contact measurement of the resistivity of semiconducting and dielectric materials), Prof. **W. Gwarek** (supervisor), Ph.D. in honours, Warsaw, Nov. 3, 2015.

[PhD3] Mariusz Leszczyński: *„Techniki analizy dyskryminacyjnej w weryfikacji twarzy”* (Discriminant analysis in face verification), Prof. **W. Skarbek** (supervisor), Warsaw, Mar. 17, 2015.

[PhD4] Anna Łysiuk: *“Nowe rozwiązania antenowe w systemach komunikacji radiowo-światłowodowej”* (New solutions for antenna systems and radiocommunication fiber), Prof. **Y. Yaschyshyn** (supervisor), Warsaw, Feb. 10, 2015.

[PhD5] Artur Nowakowski: *„Metody kalibracji aberracji geometrycznych w wizyjnych urządzeniach cyfrowych”* (Methods of calibration geometric aberractions in vision digital devices), Prof. **W. Skarbek** (supervisor), Warsaw, Dec. 14, 2015.

5.3. M.Sc. Degrees

[MSc1] Magdalena Berezowska: *“Opracowanie układu etykiety systemu lokalizacyjnego UWB/INS”* (UWB/INS positioning system mobile node), Assist. Prof. **J. Kołakowski** (supervisor), M.Sc. degree with honours.

[MSc2] Sławomir Biernat: *„Regulowany tłumik mikrofalowy sterowany mikroprocesorem”* (Digitally controlled microwave attenuator), Assist. Prof. **R. Michnowski** (supervisor).

[MSc3] Paweł Borkowski: *„Badanie możliwości wykorzystania modułu radia programowalnego do odbioru transmisji w paśmie lotniczym”* (An analysis of the possibility for using software-defined radio module for receiving aircraft band radio transmissions), Assist. Prof. **S. Kozłowski** (supervisor).

[MSc4] Joanna Agata Ceglińska: *”Oprogramowanie do symulacji propagacji światła w obiektach trójwymiarowych z wizualizacją 3D”* (Modeling of light transport in three-dimensional objects with 3D visualization), Assist. Prof. **R. Kurjata** (supervisor).

[MSc5] Wojciech Chaberek: *“Analiza pola akustycznego Studia Bloku Emisyjnego III Polskiego Radia”* (Analysis of the acoustic field at Polish Radio Recording Studio), Prof. **Z. Kulka** (supervisor).

[MSc6] Grzegorz Chmielewski: *“Badanie efektywności kompresji kodera standardu H.265/HEVC”* (Study on encoder's compression effectiveness for the H.265/HEVC video codec), Assist. Prof. **G. Pastuszak** (supervisor).

[MSc7] Bartłomiej Cholewa: *“Wpływ widowni na akustykę sal koncertowych”* (The influence of the auditorium on the acoustics of concert halls), Assist. Prof. **M. Tajchert** (supervisor).

[MSc8] Maria Cieślak: *“Rozpoznawanie ekspresji mimicznych wyrażanych na twarzy człowieka”* (Facial expression recognition), Assist. Prof. **J. Naruniec** (supervisor).

[MSc9] Michał Daniluk: *“Tworzenie 3W niesztywnych modeli twarzy z wykorzystaniem kamer głębi”* (Creating 3D face models based on an RGBD camera matrix), Assist. Prof. **J. Naruniec** (supervisor).

[MSc10] Vitomir Djaja-Jośko: *“Opracowanie cyfrowej części odbiornika ultraszerokopasmowego systemu lokalizacyjnego”* (Development of digital part of the ultra wideband localization system receiver), Assist. Prof. **J. Kołakowski** (supervisor), M.Sc. degree with honours.

[MSc11] Michał Dubaj: *„Wpływ warunków akustycznych wnętrza samochodu oraz parametrów systemu car-audio na subiektywną ocenę jakości dźwięku”* (The impact of the car interior acoustic conditions and parameters of car audio system for subjective assessment of sound quality), Assist. Prof. **M. Lewandowski** (supervisor).

[MSc12] Katarzyna Dyga: *„The individual measurement of ionization current independent of power supply polarisation in sputter ion pumps”* (Indywidualny pomiar prądu jonizacji w jonowej pompie próżniowej

niezależny od polaryzacji napięcia zasilania pompy), Assoc. Prof. **W. Wojtasiak** (supervisor), studies in English, M.Sc. degree with honours.

[MSc13] Jacek Henryk Gasztold: *"System pomiarowo-kontrolny do identyfikacji odbiorników elektrycznych na podstawie pomiaru zużycia energii"* (Measurement-control system for the identification of electronic devices based on measurement of electronic energy consumption), Prof. **W. Winiecki** (supervisor).

[MSc14] Dariusz Gauza: *„Metody klasteryzacji widm MS/MS pochodzących z badań proteomicznych"* (Algorithms for clustering MS/MS spectra from proteomic experiments), Assist. Prof. **T. Rubel** (supervisor).

[MSc15] Karol Gliwa: *"System pomiarowy parametrów termicznych przyrządów MESFET/HEMT na bazie metody delta UGS"* (System for measuring thermal characteristics of MESFET and HEMT devices basing on delta UGS method), Assist. Prof. **D. Gryglewski** (supervisor).

[MSc16] Tomasz Halczak: *„Wybór i weryfikacja nieinwazyjnej metody pomiaru centralnego ciśnienia krwi"* (Selection and verification of non-invasive method of measuring central blood pressure), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[MSc17] Zuzanna Jarosz: *"Badania porównawcze pasywnych metod pomiaru radonu w powietrzu"* (Comparative studies of passive methods of measurement of radon in the air), Assist. Prof. **P. Tulik** (supervisor).

[MSc18] Joanna Jendraszek: *„Zmodyfikowane metody pomiaru ilości mleka w piersi kobiety karmiącej"* (Modified methods of measuring the amount of milk in breastfeeding woman), Assist. Prof. **G. Domański** (supervisor).

[MSc19] Michał Jurkiewicz: *"Implementacja sprzętowa modułów estymacji kosztu kodera H.265/HEVC"* (Hardware implementation of cost estimation modules for the H.265/HEVC coder), Assist. Prof. **G. Pastuszak** (supervisor), M.Sc. degree with honours.

[MSc20] Sylwia Ewa Kamińska: *„Oprogramowanie do symulacji obrazowania z wykorzystaniem spekli laserowych"* (Application to simulate laser speckle contrast imaging), Assist. Prof. **R. Kurjata** (supervisor).

[MSc21] Tomasz Karpisz: *"Modelowanie elektromagnetyczne zjawisk nieliniowych" we włóknach światłowodowych* (Electromagnetic modeling of nonlinear phenomena in photonic crystal fibers), Assoc. Prof. **B. Salski** (supervisor).

[MSc22] Marta Ewa Karska-Szyprowska: *„Wstępna charakteryzacja materiału (Cd,Mn)Te na detektory promieniowania X i γ"* (Initial (Cd,Mn)Te material characterization for applications in X and γ detectors), Assist. Prof. **R. Szabatin** (supervisor).

[MSc23] Katarzyna Kostro: *"Generacja pobudzającego pola magnetycznego w spektroskopii nanocząsteczek superparamagnetycznych"* (The generation of the magnetic excitation field for magnetic particle spectroscopy), Assoc. Prof. **W. Smolik** (supervisor).

[MSc24] Magdalena Król: *"Implementacja i badania cyfrowego syntezatora dźwięku"* (Implementation and testing of digital sound synthesizer), Assist. Prof. **P. Bobiński** (supervisor).

[MSc25] Adam Kuczyński: *"Badania zniekształceń intermodulacyjnych w sieciach kablowych w standardzie DOCSIS 3.0"* (The measurements of intermodulation distortion in cable television network with DOCSIS 3.0 standard), Assist. Prof. **T. Keller** (supervisor).

[MSc26] Olga Kuźmińska: *"Badanie rozkładu mocy dawki w polach promieniowania neutronowego"* (The research on the effect of the dose rate distribution in the fields of neutron radiation), Assist. Prof. **P. Tulik** (supervisor).

[MSc27] Paweł Lasecki: *"Antena UWB do radaru monitorującego osoby starsze na pasmo 2 – 10 GHz"* (UWB antenna working at band-width 2 – 10 GHz for monitoring the elderly people), Assist. Prof. **K. Derzakowski** (supervisor).

[MSc28] Grzegorz Lipiński: *"Implementacja i badanie algorytmów mobilnych systemu LTE"* (Implementation and analysis of mobile-based algorithms in an LTE system), Assist. Prof. **T. Keller** (supervisor).

[MSc29] Grzegorz Lubicz-Krupowicz: *„Badanie właściwości typowych filtrów dolnoprzepustowych i pasmowo-przepustowych jako wyjściowych obwodów rezonansowych quasi-szerokopasmowych wzmacniaczy mocy"* (Analysis of parameters of typical low-pass and band-pass filters used as the output resonant circuit of the semi-wideband power amplifier), Assist. Prof. **J. Modzelewski** (supervisor).

[MSc30] Piotr Machel: *"Opracowanie wskaźnika dozymetrycznego do monitorowania narażenia na hałas pracowników branży muzycznej i rozrywkowej"* (Elaboration of dosimeter for monitoring noise exposure of music and entertainment industries employees), Assist. Prof. **M. Tajchert** (supervisor).

[MSc31] Jacek Malczyk: *"Kompensacja dryftu czasowo-przestrzennego w obrazowaniu techniką jądrowego rezonansu magnetycznego"* (Compensation of spatio-temporal variation MR scanner's static magnetic field), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[MSc32] Katarzyna Maria Malec: *"Ocena narażenia personelu medycznego na skażenia wewnętrzne"* (Exposure assessment of the

medical staff for internal contaminations), Assist. Prof. **P. Tulik** (supervisor).

[MSc33] Krzysztof Malej: *"Model mięśniowy i wzorzec stymulacyjny do roweru FES"* (Muscle model and stimulation pattern for FES cycling), Prof. **A. Grzanka** (supervisor).

[MSc34] Jacek Majer: *"Weryfikacja modeli ostrości, siły fluktuacji i szorstkości"* (Validation of models for sharpness, fluctuation strength and roughness), Prof. **J. Żera** (supervisor).

[MSc35] Małgorzata Maria Mazur: *"System pomiarowo-kontrolny do pomiarów energetycznych z wykorzystaniem sterownika CompactRIO"* (Measuring and control system for energy measurement using the CompactRIO controller), Prof. **W. Winiecki** (supervisor).

[MSc36] Mateusz Miklewski: *"Metody predykcji właściwości sekwencji aminokwasów na potrzeby badań proteomicznych"* (Methods of predicting the properties of the amino acid sequences for proteomic studies), Assist. Prof. **T. Rubel** (supervisor).

[MSc37] Maciej Murawski: *"Detekcja gestów użytkownika za pomocą sensorów urządzeń mobilnych"* (Gesture recognition using sensors in mobile devices), Assist. Prof. **K. Ignasiak** (supervisor).

[MSc38] Karolina Niemirka: *"Program do symulacji propagacji światła w strukturach biologicznych metodą Monte Carlo"* (Application for simulation of light propagation in biological structures by means of Monte Carlo method), Assist. Prof. **G. Domański** (supervisor).

[MSc39] Anna Padèe: *"Zastosowanie sztucznych sieci neuronowych w klasyfikacji danych fizyki wysokich energii"* (Artificial neural networks in data classification in high energy physics experiments), Prof. **K. Zaremba** (supervisor).

[MSc40] Ewa Katarzyna Ramus: *„System umożliwiający badanie zmęczenia oczu przy pracy przed komputerem"* (A system detecting the level of eye fatigue when working on a computer), Assist. Prof. **W. Zabołotny** (supervisor).

[MSc41] Wiktor Sienkiewicz: *„Projekt mikroprocesorowego systemu do badania chodu pacjenta"* (Microprocessor system designed to patient gait analysis), Prof. **W. Pleskacz** (supervisor).

[MSc42] Jakub Skrzypkowski: *„Porównanie algorytmów śledzących kierunek patrzenia"* (Eye gaze tracking algorithms comparison), Assist. Prof. **J. Naruniec** (supervisor).

[MSc43] Mateusz Smarzewski: *„Rekonstrukcja obrazów USG modu B przy wykorzystaniu metod rekonstrukcji sygnału próbkowanego oszczędnie"* (Mode B image reconstruction with compressed sensing), Prof. **A. Przelaskowski** (supervisor).

[MSc44] Konrad Stanik: *"Pozycjonowanie urządzeń mobilnych wewnątrz pomieszczeń z użyciem sygnałów WiFi"* (WiFi based indoor positioning system for mobile devices), Assist. Prof. **K. Ignasiak** (supervisor), M.Sc. degree with honours.

[MSc45] Michał Swat: *"Analiza własności dyspersyjnych włókien światłowodowych"* (Electromagnetic analysis of dispersive optical fibers), Assoc. Prof. **B. Salski** (supervisor).

[MSc46] Piotr Synal: *"Realizacja domowego studia inżynieryjnej obróbki dźwięku i ocena jego właściwości akustycznych"* (Implementation of home studio for engineering sound processing and evaluation of its acoustic properties), Prof. **Z. Kulka** (supervisor).

[MSc47] Dariusz Szabłowski: *"Opracowanie układu interfejsu cyfrowego do pomiaru poziomu mocy"* (Digital interface for power measurements), Assist. Prof. **R. Michnowski** (supervisor).

[MSc48] Grzegorz Szafrański: *"Badanie anteny ESPAR z opracowanym modułem sterowania"* (Research of an ESPAR antenna using control module), Prof. **Y. Yashchyshyn** (supervisor), M.Sc. degree with honours.

[MSc49] Kamil Szewczyk: *"Lokalizacja osób niewidomych w budynku z wykorzystaniem sygnału WiFi i telefonu typu smartfon"* (Indoor location system for blindness people using WiFi and smartphone), Assist. Prof. **K. Radecki** (supervisor).

[MSc50] Maciej Szczepankowski: *„Rezonans protonowo-elektronowy jako wzmocnienie sygnału protonowego przy wykorzystaniu pobudzenia impulsowego"* (Proton electron double resonance used as enhancement of nuclear signal in pulsed mode EPR pumping), Prof. **P. Bogorodzki** (supervisor).

[MSc51] Damian Szubski: *„Optymalizacja konstrukcji ortez ortopedycznych wykorzystywanych do leczenia dysfunkcji „opadającej stopy"* (Optimizing design of orthopedic braces used to treat "drop foot" dysfunction), Assoc. Prof. **M. Kwacz** (supervisor).

[MSc52] Karol Szymczyk: *"Projekt kolimatora stałego na potrzeby Europejskiego Źródła Spalacyjnego"* (Fixed Collimator for ESS), Prof. **J. Marzec** (supervisor).

[MSc53] Wojciech Toczyłowski: *"Opracowanie odbiornika korelacyjnego z cyfrową linią opóźniającą"* (Development of a correlation receiver with a digital delay line), Assist. Prof. **J. Kołakowski** (supervisor).

[MSc54] Paweł Tor: *"Stanowisko laboratoryjne do hiperpolaryzacji wody metodą Remotely Enhanced Liquids for Imaging Contrast"* (Workstation to the Polarization of Water by Remotely Enhanced Liquids for Imaging Contrast Method), Prof. **P. Bogorodzki** (supervisor).

[MSc55] Mateusz Truszczyński: *"Implementacja algorytmu kodowania i dekodowania LDPC dla zastosowań kosmicznych"* (Implementation of LDPC coding and decoding algorithms for space applications), Assist. Prof. **K. Kurek** (supervisor).

[MSc56] Marcin Waszczuk: *„Detection of routing anomalies in vehicular Ad-hoc networks"* (Detekcja anomalii routingu w sieciach Ad-hoc do użytku pomiędzy pojazdami), Assist. Prof. **T. Keller** (supervisor).

[MSc57] Michał Wieteska: *"Układ do stymulacji elektrycznej w przedklinicznych badaniach fMRI"* (System for electrical stimulation in pre-clinical fMRI studies), Prof. **P. Bogorodzki** (supervisor).

[MSc58] Kamila Witecka: „Analiza ilościowa białek na podstawie danych ze spektrometrii mas" (Mass Spectrometry-based quantitative proteomics), Assist. Prof. **T. Rubel** (supervisor), M.Sc. degree with honours.

[MSc59] Joanna Wiśniewska: *„Detekcja cech szczególnych oka w warunkach nieidealnego oświetlenia"* (Detection of characteristic eye points under non-ideal light conditions), Assist. Prof. **G. Galiński** (supervisor), M.Sc. degree with honours.

[MSc60] Augustyn Wójcik: *"Wzorce odbiorników energii elektrycznej w nieinwazyjnych metodach wyznaczania rozkładu zużycia energii elektrycznej"* (Patterns of electrical loads in nonintrusive methods of total power consumption disaggregation), Prof. **W. Winiecki** (supervisor), M.Sc. degree with honours.

[MSc61] Szymon Wójtowicz: *„Odbiornik GPS do celów dydaktycznych"* (GPS receiver for educational purposes), Assist. Prof. **W. Kazubski** (supervisor).

[MSc62] Bartłomiej Zamorski: *"Implementacja efektów dźwiękowych na procesorze sygnałowym SHARC ADSP-21065L"* (The implementation of digital sound effects using SHARC ADSP-21065L digital signal procesor), Prof. **Z. Kulka** (supervisor).

[MSc63] Łukasz Zawadka: *„Opracowanie i badanie struktur metamateriałów na częstotliwościach subterahercowych"* (Development and testing metamaterial structures on sub-THz frequencies), Assist. Prof. **P. Bajurko** (supervisor).

[MSc64] Mateusz Ziemek: *"Analiza detekcji krótkotrwałych zjawisk optycznych z wykorzystaniem detektorów opartych o macierze CMOS"* (The analysis of detection of ephemeral optical phenomena using CMOS image sensors), Assist. Prof. **J. Naruniec** (supervisor), M.Sc. degree with honours.

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

[MSc65] Błażej Grzybek: *„Optymalizacja układu aktywnego tranzystorowego generatora mikrofalowego"* (The optimization of the active circuit of the transistors microwave oscillator), Senior Lecturer **J. Skulski** (supervisor).

[MSc66] Piotr Żurad: *"Konwerter do odbiornika szerokopasmowego"* (Frequency converter to the scanning receiver), Assist. Prof. **W. Kazubski** (supervisor).

5.5. B.Sc. Degrees

[BSc1] Ammar Al-Batol: *"Implementacja sieci neuronowej przy użyciu języka OpenCL"* (Neural networks implementation on OpenCL), Assist. Prof. **T. Rubel** (supervisor).

[BSc2] Milena Weronika Budzińska: *„Program do rekonstrukcji obrazu w tomografii komputerowej"* (Software for image reconstruction in computed tomography), Assist. Prof. **G. Domański** (supervisor).

[BSc3] Monika Bukat: *„Badanie wpływu składu gazu na bazie azotu na charakterystyki komór rekombinacyjnych"* (Study of the influence of gas composition on nitrogen on characteristics of recombination chamber), Prof. **N. Golnik** (supervisor).

[BSc4] Agnieszka Katarzyna Chudek: *„Osobisty ultrasonograf - oprogramowanie do analizy i przetwarzania danych z przenośnego ultrasonografu USB"* (Personal ultrasound -- software for the analysis and visualization of data from the portable ultrasound USB), Prof. **A. Przelaskowski** (supervisor).

[BSc5] Marcin Jerzy Dąbrowski: *„Pakiet do modelowania i symulacji pomiarów w elektrycznej tomografii pojemnościowej dla środowiska MATLAB"* (Package for modelling and simulation of electrical capacitance tomography for MATLAB environment), Assoc. Prof. **W. Smolik** (supervisor).

[BSc6] Piotr Dybcio: *"Projekt i realizacja aplikacji wspomagającej subiektywną ocenę jakości sygnałów fonicznych"* (Project and implementation of application for subjective assessment of audio signal quality), Assist. Prof. **M. Lewandowski** (supervisor).

[BSc7] Piotr Eljasiak: *„Wzmacniacz o mocy wyjściowej 60 W w pasmie ISM 2.45 GHz"* (60 W Power Amplifier working in ISM 2.45 GHz band), Assist. Prof. **W. Wojtasiak** (supervisor).

[BSc8] Damian Gałązka: *"Symulator gammakamery z łączem USB"* (Gamma camera simulator using USB), Assist. Prof. **G. Domański** (supervisor).

[BSc9] Michał Gdowski: *„Analizator strumienia MPEG-4 AVC/H.264"* (MPEG-4 AVC/ H.264 stream analyzer), Assist. Prof. **A. Buchowicz** (supervisor), studies in English.

[BSc10] Jarosław Giżyński: *„Program do modelowania osłabiania promieniowania X/gamma dla wiązki szerokiej”* (Program used for modeling of wide X/gamma ray attenuation), Assist. Prof. **B. Konarzewski** (supervisor).

[BSc11] Paweł Gorgoń: *“Projekt i realizacja uniwersalnego systemu przetwarzania sygnałów fonicznych na układzie FPGA lub DSP”* (Design and implementation of universal audio signal processing system based on FPGA or DSP), Assist. Prof. **P. Bobiński** (supervisor).

[BSc12] Magdalena Hartman: *“Projekt i realizacja nagrań instrumentów smyczkowych przy wykorzystaniu odpowiednich technik studyjnych”* (Project and realization of recording string instruments by using the appropriate studio technique), Assist. Prof. **M. Lewandowski** (supervisor).

[BSc13] Patryk Hoffmann: *“Opracowanie i badanie anteny na pasmo 60 GHz”* (Modelling and research of a 60 GHz antenna), Prof. **Y. Yashchyshyn** (supervisor), B.Sc. degree with honours.

[BSc14] Maria Magdalena Huryn: *„Porównanie dwóch metod pomiaru hałasu w środowisku pracy - metody bezpośredniej i pośredniej”* (Comparison between two methods of noise measurement at workplace – direct and indirect methods), Assist. Prof. **E. Kotarbińska** (supervisor).

[BSc15] Anna Janczarska: *“Interoperacyjność biometrii tęczówki dla zmiennych warunków oświetleniowych”* (Interoperability of iris biometrics for changing lighting conditions), Assist. Prof. **A. Czajka** (supervisor).

[BSc16] Jakub Maciej Kaleta: *“Analiza pola akustycznego komory pogłosowej dla prawidłowego wyboru punktów pomiarowych”* (Analysis of sound field in reverberation chamber in order to provide the correct selection of the measurement points), Prof. **J. Żera** (supervisor).

[BSc17] Jan Kamiński: *“Realizacja bloku cyfrowej przemiany częstotliwości odbiornika DRM w strukturze FPGA”* (Digital frequency down conversion module of DRM receiver in FPGA), Assist. Prof. **K. Kurek** (supervisor).

[BSc18] Izabela Kępka: *“System detekcji i śledzenia satelitów w cyfrowych obrazach nieba”* (System of detection and satelites tracking in digital images of the sky), Assist. Prof. **J. Naruniec** (supervisor).

[BSc19] Marcin Kołakowski: *“Generator impulsów ultraszerokopasmowych w paśmie 6-8.5 GHz”* (Ultra wideband pulse generator for 6-8.5 GHz band), Assist. Prof. **R. Michnowski** (supervisor), B.Sc. degree in honours.

[BSc20] Paweł Jan Koprowski: *“Moduł do bezprzewodowego monitorowania liczników energii elektycznej”* (The module for wireless monitoring of electricity metres), Assist. Prof. **K. Mroczek** (supervisor).

[BSc21] Marcin Kostyra: *„Opracowanie oprogramowania do konfiguracji, pobierania i prezentowania danych z mierników wibroakustycznych na platformę Mac”* (Development of software used to configurate, download and display data from vibroacoustic metres for Apple Mac platform), Assist. Prof. **A. Podgórski** (supervisor).

[BSc22] Jerzy Koziołkiewicz: *“Realizacja sprzętowa szyfratora analogowego sygnału wizyjego”* (Hardware realisation of analogue video encryption), Assist. Prof. **G. Pastuszak** (supervisor).

[BSc23] Barbara Krajka: *“Regulacja automatyczna metabolizmu glukozy u diabetyków w środowisku MATLAB/Simulink”* (Closed loop control in the field of blood glucose level stabilization in diabetic patients using MATLAB/Simulink), Assoc. Prof. **K. Snopek** (supervisor).

[BSc24] Maciej Janusz Krajsman: *“Moduł oprogramowania (plug-in) do systemu obróbki danych medycznych 3D Slicer”* (Plug-in for 3D Slicer, the medical data processing system), Assist. Prof. **B. Sawionek** (supervisor).

[BSc25] Ewelina Krawczyk: *“Porównanie cech użytkowych systemów prezentacji obrazowych danych medycznych”* (Medical imaging data presentation systems' functional features' comparison), Assist. Prof. **B. Sawionek** (supervisor).

[BSc26] Kamil Kuciński: *„Obrazowanie 3D w diagnostyce i medycynie”* (3D imaging in diagnostic and medicine), Assist. Prof. **M. Sutkowski** (supervisor).

[BSc27] Łukasz Kwiatkowski: *„Realizacja elementów nadajnika radiofonii cyfrowej DRM w strukturze FPGA”* (The design of transmitter elements in digital audio broadcasting DRM standard using FPGA structure), Assist. Prof. **K. Kurek** (supervisor).

[BSc28] Andrzej Lewandowski: *„Realizacja i porównanie wybranych metod poprawy percepcji szczegółów obrazów cyfrowych”* (Realisation and assesment of methods used to improve the perception of the details on digital images), Prof. **A. Przelaskowski** (supervisor), Warsaw University of Technology Distant Learning Center (Ośrodek Kształcenia na Odległość PW).

[BSc29] Andrzej Liebert: *„Pomiar pH przy pomocy spektroskopii rezonansu magnetycznego fosforu 31P”* (The pH measurement by 31P Magnetic Resonance Spectroscopy), Prof. **P. Bogorodzki** (supervisor).

[BSc30] Konrad Maciąg: *“Kształtowanie stosunku sygnał - szum w laboratoryjnej instalacji antenowej do odbioru sygnału DVB-T”* (The signal - noise in the laboratory antenna installation to receive DVB-T), Senior Lecturer **T. Krzymień** (supervisor).

[BSc31] Kamil Madej: *"Pomiar temperatury ciała z wykorzystaniem pirometru"* (Measurement of temperature of a body using pyrometer), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[BSc32] Albert Malewski: *"Porównanie filtrów adaptacyjnych w zastosowaniach eliminacji echa akustycznego"* (The comparison of adaptive filters in acoustic echo cancellation), Prof. **Z. Kulka** (supervisor).

[BSc33] Dominika Malińska: *"Przetwarzanie i analiza obrazów mikroskopowych na potrzeby angiografii"* (Processing and analysis of microscopy images of blood vessels), Assist. Prof. **P. Garbat** (supervisor), Warsaw University of Technology Distant Learning Center (Ośrodek Kształcenia na Odległość PW).

[BSc34] Marcin Miazga: *"Projekt i badanie symulacyjne anteny na podłożu wielowarstwowym"* (Design and simulations of multilayer slot antenna), Prof. **Y. Yashchyshyn** (supervisor).

[BSc35] Jarosław Nachyła: *"Opracowanie mechanizmu wspomagającego import danych DICOM do systemu XNAT"* (Development of mechanism for importing DICOM data into XNAT system), Assist. Prof. **B. Sawionek** (supervisor).

[BSc36] Miłosz Tomasz Niesiobędzki: *"System pomiarowy jakości energii elektrycznej"* (Measurement system of the electrical energy quality), Prof. **W. Winiecki** (supervisor).

[BSc37] Jakub Ochremiak: *„Implementacja odtwarzacza multimedialnego MPEG-DASH w języku JAVASCRIPT"* (Implementation of MPEG-DASH multimedia player in JAVASCRIPT language), Assist. Prof. **A. Buchowicz** (supervisor).

[BSc38] Patryk Oleniuk: *„Realizacja części nadajnika dla satelity qubesat z wykorzystaniem układów FPGA"* (Realization of a part of a transmitter for qubesats satellite using FPGA devices), Assist. Prof. **K. Kurek** (supervisor).

[BSc39] Mateusz Olszewski: *"Inteligentny czujnik z bezprzewodowym interfejsem Mbus"* (An intelligent current meter with Wireless Mbus), Assist. Prof. **R. Łukaszewski** (supervisor).

[BSc40] Marta Orłowska: *"Algorytm trójwymiarowej rekonstrukcji szczęki i żuchwy dla potrzeb planowania leczenia operacyjnego"* (An algorithm for 3D reconstruction of maxilla and mandible for surgery planning), Assist. Prof. **R. Jóźwiak** (supervisor).

[BSc41] Mariusz Paluchowski: *"System analizy twarzy w obrazie cyfrowym"* (Face analysis system in digital image), Assist. Prof. **J. Naruniec** (supervisor).

[BSc42] Jakub Pawluczuk: *"Wirtualny analizator widma dźwięku na platformę Android"* (Virtual spectrum analyzer of sound signals on Android platform), Prof. **W. Winiecki** (supervisor).

[BSc43] Mateusz Piasek: *„Modulator DAB z układem AD9957"* (DAB modulator based on AD9957), Assist. Prof. **W. Kazubski** (supervisor).

[BSc44] Michał Franciszek Piekarski: *"Narzędzie do rejestrowania danych z telefonu komórkowego"* (Tool for recording data from a mobile phone), Assist. Prof. **T. Kosiło** (supervisor).

[BSc45] Grzegorz Pietrzak: *"Aplikacja sterowania komputera z wykorzystaniem kamery głębi i macierzy mikrofonów"* (Application for controlling personal computer with depth camera and microphone array), Assist. Prof. **J. Naruniec** (supervisor).

[BSc46] Piotr Piotrowski: *„Projekt mobilnej aplikacji wspomagającej zakupy z wykorzystaniem technologii rzeczywistości rozszerzonej"* (Mobile application supporting shopping with the use augmented reality technology), Assoc. Prof. **P. Bilski** (supervisor).

[BSc47] Krzysztof Jan Popławski: *„Analizator strumienia transportowego MPEG-2"* (MPEG-2 transport stream analyzer), Assist. Prof. **A. Buchowicz** (supervisor), studies in English.

[BSc48] Wojciech Pożoga: *"Wysokosprawna, rezonansowa przetwornica napięcia stałego typu LLC"* (High-efficiency, resonant power DC converter type LLC), Assist. Prof. **M. Mikołajewski** (supervisor).

[BSc49] Szymon Reszewicz: *"Defektoskopia radiowa materiałów kompozytowych na bazie włókien węglowych"* (Defectoscopy of carbon-fibre-reinforced polymer composites on radio frequencies), Assoc. Prof. **B. Salski** (supervisor).

[BSc50] Wojciech Rządkowski: *"Zastosowanie kwaternionów do znakowania wodnego obrazów kolorowych"* (Applications of quaternions to color image watermarking), Assoc. Prof. **K. Snopek** (supervisor).

[BSc51] Jacek Skarzyński: *"Elementy odbiornika adaptacyjnego systemu łączności z satelitą realizowane techniką SDR"* (Implementation of receiver elements of satellite adaptive communication system using SDR technique), Assist. Prof. **K. Kurek** (supervisor).

[BSc52] Marcin Artur Stelmaszczyk: *"Multimedialny kiosk informacyjny"* (Multimedia information kiosk), Assist. Prof. **G. Galiński** (supervisor).

[BSc53] Mateusz Stojek: *"Projekt i realizacja sterownika pozycjonera anteny satelitarnej"* (Design and implementation of a satellite antenna rotor controller), Senior Lecturer **H. Chaciński** (supervisor).

[BSc54] Piotr Symonides: *"Układ mnożący do odbiornika UWB z detekcją progową"* (The multiplier to the threshold detection receiver), Assist. Prof. **R. Michnowski** (supervisor).

[BSc55] Rafał Świerbutowicz: *"System wyszukiwania obrazów"* (Image retrieval system), Assist. Prof. **K. Ignasiak** (supervisor).

[BSc56] Jakub Tompolski: *"Triplekser na pasmo DC-2170 MHz, 2400-2500 MHz, 5-6 GHz"* (Triplexer for DC-2170 MHz, 2400-2500 MHz, 5-6 GHz bands), Assist. Prof. **P. Miazga** (supervisor).

[BSc57] Artur Tynecki: *"Mobilny rejestrator sygnałów EKG"* (Mobile ECG recorder), Prof. **J. Marzec** (supervisor), B.Sc. degree with honours.

[BSc58] Dawid Uklański: *"Projekt zasilacza do systemu hiperpolaryzującego gazy szlachetne metodą optycznego pompowania z wymianą spinu"* (Modification and development of SEOP hyperpolarisation system), Assist. Prof. **E. Piątkowska-Janko** (supervisor).

[BSc59] Yauheni Vasileuski: *„Hybrydowe systemy łączące VoIP i telefonię tradycyjną: Aspekty sygnalizacji i konfiguracji (Ćwiczenie laboratoryjne)"* (Hybrid systems combining VoIP and traditional telephony: aspects of signaling and configuration (Laboratory exercise)), Assist. Prof. **K. Brzeziński** (supervisor).

[BSc60] Krzysztof Alfred Wacławik: *„Projekt oraz implementacja kontrolera MIDI sterowanego bezprzewodowo"* (Project and implementation of wireless MIDI controller), Assist. Prof. **M. Lewandowski** (supervisor).

[BSc61] Piotr Warmiak: *„Program do wyznaczania informatycznej wydajności kwantowej (DQE) cyfrowych detektorów radiograficznych"* (Computer program used for determining the detective quantum efficiency (DQE) of digital radiographic detectors), Assist. Prof. **B. Konarzewski** (supervisor).

[BSc62] Tomasz Wierzbicki: *Dekompozycja tablic decyzyjnych metodą kolorowania grafu"* (Decomposition of decision tables using graph coloring), Prof. **T. Łuba** (supervisor), Warsaw University of Technology Distant Learning Center (Ośrodek Kształcenia na Odległość PW).

[BSc63] Bartosz Wilk: *"Aplikacja bazodanowa klient – serwer do obsługi konfiguracji mierników dźwięku i drgań"* (Client – server model application supporting configuration of sound and vibrations meters), Assist. Prof. **A. Podgórski** (supervisor).

[BSc64] Mateusz Winkowski: *"Wzrokowe potencjały wywołane stanu ustalonego pod kątem zastosowania w budowie interfejsu mózg--komputer"* (Steady state visually evoked potentials for use in construction of brain--computer interface), Prof. **P. Bogorodzki** (supervisor).

[BSc65] Zuzanna Włoczewska: *"Oprogramowanie do symulacji numerycznej spektrometrii w tomografii nanocząstek magnetycznych"* (Software for numerical simulation of spectrometry in magnetic particle imaging), Assoc. Prof. **W. Smolik** (supervisor).

[BSc66] Paweł Włodarczyk: *"Układ sterowania nadajnikiem węzła ultraszerokopasmowego systemu lokalizacyjnego"* (UWB positioning system anchor node controller), Assist. Prof. **J. Kołakowski** (supervisor).

[BSc67] Piotr Włodarczyk: *„Szyk antenowy na 5 GHz"* (Array antenna for 5 GHz), Prof. **Y. Yashchyshyn** (supervisor).

[BSc68] Szymon Wojczakowski: *"System do monitorowania częstości skurczu serca z bezprzewodową transmisją danych do urządzeń mobilnych"* (A system for monitoring heart rate contraction via wireless transmission to mobile devices), Prof. **G. Cybulski** (supervisor).

[BSc69] Szymon Wojdat: *„Bateryjne urządzenie do pomiaru częstości skurczów serca z bezprzewodową transmisja danych"* (Batery--operated heart rate measuring device with wireless data transmission), Prof. **G. Cybulski** (supervisor).

[BSc70] Piotr Wójcik: *„Analiza warunków akustycznych w studio nagrań dźwiękowych Zakładu Elektroakustyki oraz propozycja mobilnej adaptacji akustycznej"* (Acoustical conditions analysis in a Studio of Electroacoustic Division and mobile acoustical adaptation), Assist. Prof. **M. Lewandowski** (supervisor).

[BSc71] Magdalena Wiktoria Wysoczańska: *„Pomiar sztywności tętnic"* (Measurement of arterial stiffness), Senior Lecturer **T. Jamrógiewicz** (supervisor).

[BSc72] Anna Zawistowska: *"Wizyjny system do wyznaczania wad postawy - kończyny dolne"* (Vision system for determining posture - lower limbs), Assist. Prof. **M. Sutkowski** (supervisor).

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

[BSc73] Michał Baran: *"Sterownik migawki z selektorem filtrów utwardzających do radiografii cyfrowej"* (The shutter driver with X-ray filter selector for digital radiography), Assist. Prof. **M. Dziewiecki** (supervisor).

[BSc74] Michał Kłósek: *"Projekt i realizacja dwudrożnej kolumny głośnikowej do systemu audio"* (Design and creation of a two-way loudspeaker for audio system), Assist. Prof. **P. Bobiński** (supervisor).

[BSc75] Tomasz Pniewski-Przygodzki: *"Układ generacji sygnałów wyzwalających dla akceleratorów liniowych"* (Signal generation system for linear accelerations), Assist. Prof. **M. Dziewiecki** (supervisor).

[BSc76] Nguyen Huu Thinh: *"Implementacja osadzania metadanych w plikach obrazowych"* (Implementation of metadata embedding in image files), Assist. Prof **G. Galiński** (supervisor).

[BSc77] Adam Wysocki: *„Układ kontroli chłodzenia wodnego w akceleratorach"* (Water-cooling control system for linear accelerator), Assist. Prof. **A. Wysocki** (supervisor)

6. PUBLICATIONS

6.1. Scientific and technical books, chapters in books

[Pub1] J. Cichocki, J. Modelski: „Maxwell, Marconi i następcy – czyli o technicznych podstawach radiofonii" (Maxwell, Marconi and Successors – that is, about Technical Basics of Radio Broadcasting), in: A. Ossibach-Budzyński (Ed.), *Polskie Radio Historia-Program-Technika, 90 lat Polskiego Radia* (Polish Radio History-Programme-Technique, 90th Anniversary of the Polish Radio), *Wydawcy: Polskie Radio SA, Oficyna Wydawnicza ASPRA-JR*, ISBN: 978-83-7545-654-7 (2015), pp. 67-88.

[Pub2] Z. Kulka: "Kształtowanie widma szumu kwantowania/rekwantowania w fonicznych przetwornikach analogowo-cyfrowych i cyfrowo-analogowych" (Application of Noise Shaping in Audio A/D and D/A Converters), in: T. Rogala (Ed.), *Sztuka słuchania* (Art of Listening), *Wyd. Uniwersytetu Muzycznego Fryderyka Chopina*, ISBN: 978-83-61489-63-4 (2015), pp. 175-213.

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.

[Pub3] K. Abe (…), M. Dziewiecki, R. Kurjata, P. Płoński, A. Rychter, K. Zaremba, M. Ziembicki (346 external authors): „Measurement of the ν_μ Charged Current Quasielastic Cross Section on Carbon with the T2K on-axis Neutrino Beam", *Physical Review D,* vol. 91, no. 11 (2015), doi: 10.1103/PhysRevD.91.112002, pp. 11002--1-112002-17.

[Pub4] K. Abe (….), M. Dziewiecki, R. Kurjata, P. Płoński, K. Zaremba, M. Ziembicki (340 external authors): „Neutrino Oscillation Physics Potential of the T2K Experiment", *Progress of Theoretical and Experimental Physics* (2015), doi: 10.1093/ptep/ptv031, pp. 043C01-1-043C01-36.

[Pub5] K. Abe (…), M. Dziewiecki, R. Kurjata, P. Płoński, A. Rychter, K. Zaremba, M. Ziembicki (340 external authors): "Measurement of the Electron Neutrino Charged- current Interaction Rate on Water with the T2K ND280 pi-zero Detector", *Physical Review D,* vol. 91, no. 11 (2015), doi: 0.1103/PhysRevD.91.112010, pp. 112010- -1-112010-11.

[Pub6] K. Abe (…), M. Dziewiecki, R. Kurjata, P. Płoński, A. Rychter, K. Zaremba, M. Ziembicki (350 external authors): „Measurements of Neutrino Oscillation in Appearance and Disappearance Channels by the T2K Experiment with 6.6 x 10^{20} Protons on Target", *Physical Review D* vol. 91(2015), pp. 072010-1-072017.

[Pub7] K. Abe (…), M. Dziewiecki, R. Kurjata, P. Płoński, A. Rychter, K. Zaremba, M. Ziembicki (361 external authors): „Measurement of the ν_μ Charged-Current Quasielastic Cross Section on Carbon with the ND280 Detector at T2K", *Physical Review D*, vol. 92 (2015), pp. 112003-1--112003-14.

[Pub8] K. Abe (…), M. Dziewiecki, R. Kurjata, P. Płoński, A. Rychter, K. Zaremba, M. Ziembicki (332 external authors): "Search for Short Baseline *ve* Disappearance with the T2K Near Detector", *Physical Review D,* vol. 91, no. 5 (2015), doi: 10.1103/PhysRevD.91.051102, pp. 051102-1-112010-8.

[Pub9] Ph. Abbon (…), M. Dziewiecki, R. Kurjata, J. Marzec, A. Rychter, K. Zaremba, M. Ziembicki, (227 external authors): „The COMPASS Setup for Physics with Hadron Beam*", Nuclear Instruments and Methods in Physics Research A*, vol. 779 (2015), doi: 10.1016/j.nima.2015.01.035, pp. 69-115.

[Pub10] C. Adolph (…), M. Dziewiecki, R. Kurjata, J. Marzec, A. Rychter K. Zaremba, M. Ziembicki, (213 external authors): „Odd and Even Partial Waves of $\eta\pi-$ and $\eta\pi-$ in $\pi-p \longrightarrow \eta^{(\prime)}\pi-p$ at 191 GeV/*c*", *Physics Letters B*, vol. 740 (2015), pp. 303-311.

[Pub11] C. Adolph (…), M. Dziewiecki, R. Kurjata, J. Marzec, A. Rychter K. Zaremba, M. Ziembicki, (209 external authors): „Collins and Sivers Asymmetries in Muonproduction of Pions and Kaons off Transversely Polarised Protons", *Physics Letters B*, vol. 744 (2015), pp. 250-259.

[Pub12] C. Adolph (…), M. Dziewiecki, R. Kurjata, J. Marzec, A. Rychter K. Zaremba, M. Ziembicki, (205 external authors): „Observation of a New Narrow Axial-Vector Meson a_1 (1420)", *Physical Review Letters*, vol. 115, doi: http://dx. doi.org/10.1103/ PhysRevLett. 115.082001, pp. 082001-1-082001-6.

[Pub13] C. Adolph (…), M. Dziewiecki, R. Kurjata, J. Marzec, A. Rychter K. Zaremba, M. Ziembicki, (203 external authors): „Search for Exclusive Photoproduction of Zc± (3900) at COMPASS", *Physics Letters B*, vol. 742 (2015), pp. 330-334.

[Pub14] C. Adolph (…), M. Dziewiecki, R. Kurjata, J. Marzec, A. Rychter K. Zaremba, M. Ziembicki, (207 external authors): „Measurement of the Charged-Pion Polarizability", *Physical Review Letters*, vol. 114, doi: 10.1103/PhysRevLett.114. 062002, pp. 062002-1 - 062002-6.

[Pub15] N.A. Andrushchak, I. D. Karbovnyk, K. Godziszewski, Y. Yashchyshyn, M.V. Lobur, A. S. Andrushchak, "New Interference Technique for Determination of Low Loss Material Permittivity in the Extremely High Frequency Range", *IEEE Transactions on Instrumentation and Measurement*, vol. 64, no. 11 (2015), doi: 10.1109/TIM.2015. 2437631, pp. 3005-3012.

[Pub16] N. Anfimov (…), M. Dziewiecki, R. Kurjata, P. Płoński, A. Rychter, K. Zaremba, M. Ziembicki (18 external authors): „Tests of the Module Array of the ECAL0 Electromagnetic Calorimeter for the COMPASS Experiment with the Electron Beam at ELSA", *Physics of Particles and Nuclei Letters,* vol. 12, no. 4 (2015), doi: 10.1134/S1547477115040044, pp. 566- -569.

[Pub17] M. Antonello (…), P. Płoński, K. Zaremba (56 external authors): „Operation and Performance of the ICARUS T600 Cryogenic Plant at Gran Sasso Underground Laboratory", *Journal of Instrumentation,* vol. 10, no. 12 (2015), doi: 10.1088/1748-0221/10/12/P12004, pp. 12004-1 – 12004-22.

[Pub18] P. Bilski: "Analysis of the Classifier Fusion Efficiency in the Diagnostics of the Accelerometer", *Measurement*, vol. 67, doi: 10.1016/j.measurement.2015.02.002 (2015), pp. 116-125.

[Pub19] P. Kopyt, B. Salski J. Marczewski, P. Zagrajek, J. Łusakowski: „Parasitic Effects Affecting Responsivity of sub-THz Radiation Detector Built of a MOSFET", *Journal of Infrared, Millimeter, and Terahertz Waves*, vol. 36 (2015), pp. 1059-1075.

[Pub20] M. Kordus, R. S. Tyler, J. Żera, J. J. Oleson: „An Influence of Directional Microphones on the Speech Intelligibility and Spacial Perception by Cochlear Implant Users", *Archives of Acoustics* vol. 40, no. 1 (2015), pp. 81-92.

[Pub21] Ł. A. Małek, K. Werys, M. Kłopotowski, M. Śpiewak, B. Miłosz-Wieczorek, Ł. Mazurkiewicz, M. Marczak, A. Witkowski: „Native T1-Mapping for Non-Contrast Assessment of Myocardial Fibrosis in Patients with Hypertrophic Cardiomyopathy – Comparison with Late Enhancement Quantification", *Magnetic Resonance Imaging*, vol. 33 (2015), pp. 718-724.

[Pub22] P. Mazurek, P. Czyżak, H. de Waardt, J. P. Turkiewicz: „Semiconductor Optical Amplifiers and Raman Amplificaton for 1310-nm Dense Wavelength Division Multiplexed Transmission", *Optical Engineering*, vol. 54, no. 11 (2015), pp. 116104-1-116104-8.

[Pub23] M. Mikula, T. Rubel, J. Karczmarski, M. Statkiewicz, K. Bomsztyk, J. Ostrowski: „Beads-free Protein Immunoprecipitation for a Mass Spectrometry-based Interactome and Posttranslational Modifications Analysis", *Proteome Science*, vol. 13, no. 23, doi: 10.1186/s12953-015-0079-0 (2015), published online, 7 pp.

[Pub24] M. Olszewska-Placha, B. Salski, D. Janczak, P. R. Bajurko, W. Gwarek, M. Jakubowska: „A Broadband Absorber with a Resistive Pattern Made of Ink with Graphene Nano-Platelets", *IEEE Transactions on Antennas and Propagation*, vol. 63, no. 2 (2015), doi: 10.1109/TAP.2014.2379932, pp. 565-572.

[Pub25] G. Pastuszak: "Flexible Architecture Design for H.265/HEVC Inverse Transform", *Circuits Systems and Signal Processing*, vol. 34 (2015), doi: 10.1007/s00034-014- -9933-z, pp. 1931-1945.

[Pub26] G. Pastuszak: "Hardware Architectures for the H.265/HEVC Discrete Cosine Transform", *IET Image Processing*, vol. 9, issue 6 (2015), doi: 10.1049/iet-ipr.2014.0277, pp. 468-477.

[Pub27] G. Pastuszak: "Architecture Design of the H.264/AVC Encoder Based on Rate-Distortion Optimization", *IEEE Transactions on Circuits and Systems for Video Technology*, vol. 25, no. 11 (2015), pp. 1844-1856.

[Pub28] D. S. Radomski: "A Nonlinear Parametrization of Multivariate Electrohysterographical Signals", *Computers in Biology and Medicine*, vol. 67 (2015), pp. 13-20.

[Pub29] B. Salski, W. Gwarek, P. Korpas, Sz. Reszewicz, A. Y. B. Chong, P. Theodorakeas, I. Hatziioannidis, V. Kappatos, C. Selcuk, T.-H. Gan, M. Koui, M. Iwanowski, B. Zieliński: „Non-Destructive Testing of Carbon-Fibre-Reinforced Polymer Materials with a Radio-Frequency Inductive Sensor", *Composite Structures*, vol. 122 (2015), pp. 104-112.

[Pub30] B. Salski, T. Karpisz, R. Buczyński: „Electromagnetic Modeling of Third-Order Nonlinearties in Photonic Crystal Fibres Using a Vector Two-Dimensional FDTD Algorithm", *IEEE Journal of Lightwave Technology*, vol. 33, no. 3 (2015), pp. 2905-2912.

[Pub31] Z. Setkowicz, A. Gaździńska, J. J. Osoba, K. Karwowska, P. Majka, J. Orzeł, B. Kossowski, P. Bogorodzki, K. Janeczko, M. Wyleżoł, S. P. Gaździński: „Does Long-Term High Fat Diet Always Lead to Smaller Hippocampi Volumes, Metabolite Concentrations, and Worse Learning and Memory? A Magnetic Resonance and Behavioral Study in Wistar", *PLOS ONE* (2015), doi: 10.1371/journal.pone.0139987, published online, 6 pp.

[Pub32] Ł. M. Szafron, A. Balcerak, E. A. Grzybowska, B. Pieńkowska-Grela, A. Podgórska, R. Zub, M. Olbryt, J. Pamuła-Piłat, K. M. Lisowska, E. Grzybowska, T. Rubel, A. Dansonka-Mieszkowska, B. Konopka, M. Kulesza, M. Łukasik, J. Kupryjańczyk: „The Putative Oncogene, *CRNDE*, is a Negative Prognostic Factor in Ovarian Cancer Patients", *Oncotarget*, doi: 10.18632/oncotarget.6016, published online, 8 pp.

[Pub33] Ł. M. Szafron, A. Balcerak, E. A. Grzybowska, B. Pieńkowska-Grela, A. Felisiak-Gołąbek, A. Podgórska, M. Kulesza, N. Nowak, P. Pomorski, J. Wysocki, T. Rubel, A. Dansonka-Mieszkowska, B. Konopka, M. Kulesza, M. Łukasik, J. Kupryjańczyk: „The Novel Gene *CRNDE Encodes a Nuclear Peptide (CRNDEP)* which is Overexpressed in Highly Proliferating Tissues", *PLOS ONE*, vol. 10, no. 5, doi: 10.1371/journal.pone.0127475 (2015), published online, 24 pp.

[Pub34] A. Taube, E. Kamińska, M. Kozubal, J. Kaczmarski, W. Wojtasiak, J. Jasiński, M. A. Borysiewicz, M. Ekielski, M. Juchniewicz, J. Grochowski, M. Myśliwiec, E. Dynowska, A. Barcz, P. Prystawko, M. Zając, R. Kucharski, A. Piotrowska: „Ion Implantation for Isolation of AlGaN/Gan HEMTs using C or Al", *Physics Status Solidi A: Applications and Materials Science* vol. 212, issue 5 (2015), doi: 10.1002/pssa. 201431724, pp. 1162-1169.

[Pub35] Y. Yashchyshyn, K. Derzakowski, P. R. Bajurko, J. Marczewski, S. Kozłowski: "Time-Modulated Reconfigurable Antenna Based on Integrated S-PIN Diodes for mm-Wave Communication Systems", *IEEE Transactions on Antennas and Propagation*, vol. 63, no. 9 (2015), doi: 10.1109/TAP. 2015.2444425, pp. 4121-4131.

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.

[Pub36] A. Abramowski: „Suboptymalny algorytm wyboru trybu predykcji wewnątrzobrazowej dla standardu H.265/HEVC" (Suboptimal Intra Mode Selection Algorithm for the H.265/HEVC Standard), *Elektronika-Konstrukcje-Technologie-Zastosowania*, vol. LVI, no. 7 (2015), doi: 10.15199/13.2015. -7.12, pp. 59-61.

[Pub37] A. Badawika, J. Kołakowski: „Zmodyfikowana metoda lokalizacji nadajnika z wykorzystaniem techniki RSS" (Modified Method of the Transmitter's Location using RSS Technology), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne* no. 4 (2015), doi: 10.15199/59.2015.4.45, pp. 290-293.

[Pub38] M. Berezowska, J. Kołakowski: „Ultraszerokopasmowy system monitorowania osób starszych" (Ultrabroadband System for the Elderly Persons Monitoring), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne* no. 4 (2015), doi: 10.15199/59. 2015.4.24, pp. 209-212.

[Pub39] A. Bilski, P. Bilski, J. Wojciechowski: „Zastosowania metod optymalizacyjnych w diagnostyce systemów analogowych" (Overview of Optimization Methods in Diagnostics of Analog Systems), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne,* vol. LXXXIV, no. 6 (2015), doi: 10.15199/59. 2015.6.5, pp. 611-617.

[Pub40] G. Bogdan, Y. Yashchyshyn: „Kształtowanie charakterystyki grupowej za pomocą wieloportowych przełączników mikrofalowych" (Time-modulated Antenna Array Beamforming based on Multiport Switches), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne,* vol. LXXXIV, no. 4 (2015), doi: 10.15199/59.2015.4.43, pp. 282-285.

[Pub41] K. Derzakowski: „Częstotliwości rezonansowe wielowarstwowego rezonatora zawierającego ośrodki o anizotropii jednoosiowej" (Resonant Frequencies of Multilayered Resonator Containing Uniaxial Anisotropic Media), *Elektronika-Konstrukcje-Technologie-Zastosowania*, vol. LVI, no. 7 (2015), doi: 10.15199/ 13.2015.7.10, pp. 45-51.

[Pub42] V. Djaja-Jośko, J. Kołakowski: „Badania dokładności wyznaczania TDOA w ultraszerokopasmowym systemie lokalizacyjnym" (Research Accuracy in Deteriminig TDOA Localization in Ultrabroadband System), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne,* vol. LXXXIV, no. 4 (2015), doi: 10.15199/59.2015.4.57 pp. 337-340.

[Pub43] G. Domański, B. Konarzewski, R. Kurjata, J. Marzec, K. Zaremba, M. Dziewiecki, M. Ziembicki, A. Rychter: „Analiza wpływu parametrów wzmacniacza operacyjnego na pracę integratora kluczowanego" (Analysis of the Influence of Operational Amplifier Parameters on Work of Operational Amplifier Parameters on Work of Switched Integrator), *Elektronika-Konstrukcje-Technologie-Zastosowania*, vol. LVI, no. 7 (2015), doi: 10.15199/13.2015.7.3, pp. 16-19.

[Pub44] M. Dziewiecki, A. Rychter, M. Ziembicki: „Badanie fotopowielaczy w warunkach ziemskiego pola magnetycznego" (Photomultiplier Testing under Earth's Magnetic Field), *Elektronika-Konstrukcje-Technologie-Zastosowania*, vol. LVI, no. 7 (2015), doi: 10.15199/13. 2015.7.4, pp. 20-23.

[Pub45] K. Godziszewski, Y. Yashchyshyn: „Rozwój metod charakteryzacji materiałów w zakresie subterahercowym" (Development of Material Characterization in sub-Terahertz Range), *Elektronika-Konstrukcje-Technologie-Zastosowania*, vol. LVI, no. 7 (2015), doi: 10.15199/13.2015.7.9, pp. 42-44.

[Pub46] D. Gryglewski, M. Góralczyk, Sz. Sokół: „Wzmacniacz niskoszumny z tranzystorem

GaN PolHEMT na pasmo L" (L-band LNA Amplifier with GaN PolHEMT), *Przegląd Elektrotechniczny*, vol. 91, no. 9 (2015), doi: 10.15199/48.2015.09.01 pp. 36-40.

[Pub47] W. Janke, W. Wojtasiak: „Właściwości i zastosowania tranzystorów HEMT na bazie azotku galu" (The Basic Properties and Applications of GaN HEMT Transistors), *Przegląd Elektrotechniczny*, vol. 91, no. 9 (2015), doi: 10.15199/48.2015.09.18 pp. 65-73.

[Pub48] T. Karpisz, B. Salski: „Modelowanie elektromagnetyczne zjawisk nieliniowych we włóknach światłowodowych" (Electromagnetic Modeling of Nonlinear Effects in Optical Fibers), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne* no. 4 (2015), doi: 10.15199/59.2015.4.104, pp. 524-527.

[Pub49] J. Kołakowski, M. Berezowska, K. Radecki, V. Djaja-Jośko, R. Michnowski, J. Cichocki, A. Badawika, Ł. Malicki: „System do monitorowania ruchu osób starszych" (System for Elderly Persons Mobility and Behaviour Monitoring), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne,* vol. LXXXIV, no. 6 (2015), doi: 10.15199/59.2015.6.7 pp. 603-608.

[Pub50] M. Kołakowski, R. Michnowski: „Źródło sygnału w ultraszerokopasmowym systemie lokalizacyjnym" (Signal Source in UWB Localization System), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne* no. 4 (2015), doi: 10.15199/59.2015.4.56 pp. 333-336.

[Pub51] P. Kopyt: „Detektory promieniowania sub-THz budowane z użyciem krzemowych tranzystorów typu MOSFET" (Sub-THz Radiation Detectors Built of Si-MOSFETs), *Elektronika-Konstrukcje-Technologie-Zastoso--wania*, vol. LVI, no. 7 (2015), doi: 10.15199/13.2015.7.8, pp. 37-41.

[Pub52] P. Kopyt, B. Salski, W. Gwarek, M. Olszewska-Placha, D. Janczak, M. Słoma, M. Jakubowska: „Antena UHF na bazie grafenu dla znacznika RFID" (Graphene-based Dipole Antenna for a UHF RFID Tag), *Elektronika-Konstrukcje-Technologie-Zastosowania*, vol. LVI, no. 10 (2015) doi: 10.15199--/13.2015.10.10, pp. 50-53.

[Pub53] S. Kozłowski, K. Kurek, J. Skarzyński, K. Szczygielska, M. Darmetko: „Technika SDR w realizacji łączności z satelitą na orbicie niskiej" (Implementation of SDR Technique in Communications with LEO Satellite), *Przegląd Telekomunikacyjny i Wiadomości Telekomunikacyjne,* vol. LXXXIV, no. 6 (2015), doi: 10.15199/59.2015.6.3 pp. 623-627.

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[Pub205] J. Modelski (Ed.): "45 lat Instytutu Radioelektroniki Politechniki Warszawskiej 1970--2015" (45 Years of the Institute of Radioelectronics, WUT, 1970-2015), *Elektronika--Konstrukcje - Technologie - Zastosowania*, no. 7 (2015), 1 p.

7. RESEARCH REPORTS

[Rep1] P. Bajurko: *„Pomiary współczynnika odbić zwierciadlanych od elektromagnetycznych materiałów pochłaniających”* (Specular Reflectivity Measurements of Electromgnetic Absorber Materials), Final report for the E&C Anechoic Chambers N.V.,, Belgium, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, May 2015.

[Rep2] S. Bhadra (…), M. Dziewiecki, J. Marzec, R. Kurjata, A. Rychter, M. Ziembicki: „Proposal for the NuPRISM Experiment in the J-PARC Neutrino Beamline”, Final report from 20th J-PARC Program Advisory Committee Meeting, Jul. 2015.

[Rep3] P. Bogorodzki, E. Piątkowska-Janko: *„Badanie obrazowe z wykorzystaniem techniki MRI w ramach realizowanego wspólnie tematu badawczego: Morfometria mózgu małych zwierząt”* (Imaging Study Using MRI Techniques Implemented in the Framework of Joint Research Topic: Small Animal Brain Morphometry), Final report for the Warsaw University of Life Sciences, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Jan. 2015.

[Rep4] G. Domański, J. Majdecki, Sz. Czupryński, B. Gruszka, M. Dwojak: *“Detektor scyntylacyjny z matrycą fotodiod lawinowych do rejestracji promieniowania jonizującego w zastosowaniach biomedycznych”* (Scintillation Detector with Matrix of Avalanche Photodiodes for the Detection of Ionizing Radiation in Biomedical Applications), Final report for the Rector grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep5] M. Dziewiecki: *“Badanie fotopowielaczy w warunkach kontrolowanego pola magnetycznego”* (Investigation of the Photomultipliers in Controlled Magnetic Field), Final report for the Dean grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep6] T. Filipek: *„Opracowanie metod linearyzacji mikrofalowych impulsowych wzmacniaczy mocy”* (Linearization Methods of Microwave Pulse Power Amplifiers), Final report for the Foundation for Polish Science, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Jan. 2015.

[Rep7] W. Gwarek, B. Salski, P. Kopyt, M. Olszewska-Placha: *„Grafenowe pasty i atramenty do drukowania ścieżek i warstw przewodzących w zastosowaniu do zabezpieczania dokumentów GRAFINKS”* (Graphene Pastes and Inks for Printing Conductive Paths and Layers for Document Protection), Final report for GRAF-TECh project, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep8] 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-Placha, 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 and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep9] K. Ignasiak, W. Skarbek, A. Buchowicz, G. Galiński, J. Naruniec, G. Pastuszak, A. Abramowski, G. Brzuchalski, M. Roszkowski, M. Wieczorek, M. Trochimiuk, G. Gwardys, D. Grzywczak: *„Audiowizualne sieciowe systemy hybrydowe”* (Audiovisual Network Hybrid Systems), Final report for the statutory grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep10] J. Kołakowski, J. Cichocki, R. Michnowski: *„Rozproszony system do pomiaru temperatury tężejącego betonu”* (Distributed System for Concrete Curing Temperature Measurement), Final report for the MOSTOSTAL Warszawa, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep11] J. Kołakowski, J. Cichocki, R. Michnowski, K. Radecki, W. Kiełek, S. Żmudzin, A. Badawika: *„Badania funkcji określania odległości z wykorzystaniem ultraszerokopasmowych sieci radiowych”* (Investigation of Distance Measurements Function in UWB Radio Networks), Final report for the statutory grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep12] P. Kopyt: *“Projekt anten na potrzeby detektorów promieniowania THz na tranzystorach HBT wytwarzanych na podłożu InP”* (Designing of the Antennas for THz HBT Radiation Detectors at InP Surface), Final report for the HFT Opto Ltd., Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Mar. 2015.

[Rep13] P. Kopyt, W. Gwarek: *„Wielopikselowy detektor promieniowania THz zrealizowany z wykorzystaniem selektywnych tranzystorów MOS i jego zastosowanie w biologii, medycynie i systemach bezpieczeństwa”* (Multi-Pixel THz Radiation Detector with Selective MOS Transistors and its Application in Biology, Medicine and Security Systems), Final report for National Centre for Research and Development grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Oct. 2015.

[Rep14] J. Modelski, K. Kurek, T. Keller, M. Bury, M. Darmetko: *„Analiza możliwości zastosowania modulacji wieloczęstotliwościowych w łączności satelitarnej”* (Analysis of Applicability of Multi-Frequency in Satellite

Communication), Final report for the statutory grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep15] J. Modzelewski, H. Chaciński, W. Kazubski, M. Mikołajewski: *„Doskonalenie układów, analiza i metody projektowania przełącznikowych wzmacniaczy mocy klasy E i liniowych wzmacniaczy mocy na zakres 3-30MHz”* (Analysis, Design methods, and Circuit Improvement of Switch-Mode Class-E Amplifiers and Wideband 3-30 MHz Linear Power Amplifiers), Final report for the statutory grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep16] R. Z. Morawski, A. Miękina, A. Podgórski: *„Metodologiczne i metametrologiczne aspekty przetwarzania danych pomiarowych”* (Methodological and Meta-metrological Aspects of Measurement Data Processing), Final report for the statutory grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep17] K. Snopek, S. Kozłowski, K. Snopek, A. Bilski, Ł. Błaszczyk: *„Badania w zakresie sygnałów i sieci”* (Research in the Field of Signals and Networks), Final report for the statutory grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep18] R. Szabatin, P. Brzeski, W. Smolik, T. Olszewski: *„Prototyp systemu oparty na elektrycznym tomografie pojemnościowym oraz optycznej detekcji do optymalizacji i kontroli jakości produktu”* (The Prototype System based on Electrical Capacitance Tomography and Optical Detection to Optimize Production and Quality Control), Final report for the NETRIX joint-stock company, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Sept. 2015.

[Rep19] K. Werys: *“Metoda badania ruchu mięśnia sercowego przy użyciu technik rezonansu magnetycznego:”* (Myocardial Motion Estimation Using Magnetic Resonance Imaging Method), Final report for the National Science Center, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Oct. 2015.

[Rep20] W. Winiecki, P. Bilski, P. Czernik, R. Łukaszewski, K. Mroczek, J. Olszyna: *”Analiza metod identyfikacji odbiorników w sytemach monitorowania zużycia energii elektrycznej”* (Analysis of the Methods for the Electrical Appliances Identification in the Systems of the Energy Consumption Monitoring), Final report for the statutory grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep21] W. Wojtasiak, D. Rosołowski, D. Gryglewski, W. Gwarek: „*Tranzystory mikrofalowe HEMT AlGaN/Ga na monokrystalicznych podłożach GaN”* (Microwave S Band HEMT Transistor based on AlGaN/GaN Heterostructures Grown on Bulk Monocrystalline GaN Substrates), Final report for the National Centre for Research and Development grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Oct. 2015.

[Rep22] Y. Yashchyshyn, P. Bajurko K. Derzakowski, A. Łysiuk, K. Godziszewski, G. Bogdan, P. Piasecki: *„Badania wpływu niedoskonałości wykonania struktur wielowarstwowych na dokładność charakteryzacji materiałów”* (Investigation of the Influence of Imperfections in Multilayer Structures on the Accuracy of Material Characterization), Final report for the statutory grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep23] K. Zaremba, P. Bogorodzki, P. Brzeski, G. Domański, M. Dziewiecki, T. Jamrógiewicz, B. Konarzewski, R. Kurjata, J. Marzec, T. Olszewski, E. Piątkowska-Janko, D. Radomski, B. Sawionek, W. Smolik, R. Szabatin, M. Ziembicki, W. Gradkowski, J. Kryszyn, W. Obrębski, A. Rychter, K. Werys: *„Nowoczesne techniki elektroniki jądrowej i medycznej”* (Modern Techniques in Nuclear and Medical Electronics), Final report for the statutory grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

[Rep24] J. Żera, Z. Kulka, P. Bobiński, E. Kotarbińska, A. Leszczyński, M. Lewandowski, M. Tajchert: *„Projektowanie i badania systemów elektroakustycznych oraz systemów oceny jakości dźwięku”* (Design and Investigation of Electroacoustic Measuring Systems and Digital Audio Signal Processing Systems), Final report for the statutory grant, Institute of Radioelectronics and Multimedia Technology, WUT, Warsaw, Dec. 2015.

8. PATENTS AND PATENT APPLICATIONS

[Pat1] P. Bajurko: *„Antena tubowa diagonalna”* (A diagonal horn antenna), Patent application P-413078, Jul. 09, 2015.

[Pat2] P. Bajurko: *“Planarna antenna dipolowa z ekranem przewodzącym”* (Planar dipole antenna with conductive patch), Patent P-399395, Sept. 4, 2015.

[Pat3] M. Olszewska, B. Salski, D. Janczak, W. Gwarek, M. Jakubowska, G. Wróblewski, A. Młoźniak, M. Słoma: *„Panel pochłaniający promieniowanie elektromagnetyczne”* (Electromagnetic radiation absorbing dashboard), Patent no. PL 405420-A1, Mar. 30, 2015.

[Pat4] A. Strupczewski, J. Naruniec, K. Mucha, B. Czupryński: *„Eye gaze tracking method and apparatus and computer-readable recording medium”*, US Patent, no. US 2015/0293588 A1, Samsung Electronics Co., Ltd., Oct. 15, 2015.

9. SCIENTIFIC EVENTS

9.1 Scientific events co-organized by the Institute

[Con1] *The 8th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications: IDAACS'2015* (Warsaw, Poland, Sept. 24-26, 2015), J. Modelski (member of the Honorary Committee), W. Winiecki (conference co-chairman, member of the International Advisory Board), R. Z. Morawski (coordinator of the Special Stream in Computer Systems for Healthcare and Medicine), P. Bilski (co-chairman of the Organizing Committee, coordinator of the Special Stream in Advanced Testing and Diagnostics, member of the International Programme Committee, R. Łukaszewski, A. Bilski (members of the Organizing Committee), P. Bogorodzki, K. Snopek, J. Kołakowski, R. Michnowski, A. Miękina, K. Mroczek, J. Naruniec, K. Radecki, Ł. Błaszczyk, V. Djaja-Jośko, M. Kowalski, P. Mazurek, J. Wagner, K. Werys (participants).

[Con2] *Nauka w czasach biurokracji – seminarium WEiTI PW* (Science in Time of Bureaucracy) – WUT Seminar (Warsaw, Poland, Nov. 3, 2015), R. Z. Morawski (keynote speaker).

[Con3] *16th International Symposium on Sound Engineering and Tonmeistering: ISST 2015* (Warsaw, Oct. 8-10, 2015), J. Żera chairman of the Programme Committee), J. Modelski (member of the Programme Committee), Z. Kulka (chair of the Organizing Committee), M. Lewandowski, G. Makarewicz, M. Tajchert (members of the Organizing Committee), *Radiokomunikacja w dobie multimediów* (Radiocommunication in Time of Multimedia) the presentation given by J. Modelski.

[Con4] *International Conference: Multimedia – Technology, Design, Management* in the frame of EEA Grants and Norway Grants projects within Development of the Polish Universities Measure of Scholarship and Training Fund (Warsaw, Poland, Nov. 16-17, 2015), J. Modelski, W. Skarbek, K. Zaremba, J. Żera (members of the Steering and Programme Committee), A. Buchowicz (chair of the Organizing Committee), A. Czarnecka, K. Ignasiak (members of the Organizing Committee).

9.2. International scientific events

[Con5] *8th Cost Action Meeting* (Berlin, Germany, Mar. 13, 2015), Y. Yashchyshyn (participant).

[Con6] *Conference on Non-destructive Testing in Automotive Industry* (Maranello, Italy Apr. 15, 2015), B. Salski (participant).

[Con7] *Interdisciplinary International PhD Workshop: I²PhDW 2015* (Międzyzdroje, Poland, May 14-17, 2015), J. Kryszyn (speaker).

[Con8] *IEEE International Microwave Symposium* (Phoenix, USA, May 16-28, 2015), J. Modelski (member of the Steering Committee), W. Gwarek (speaker).

[Con9] *International Workshop on Hadron Structure and Spectroscopy* (Suzdal, Russia, May 18--20, 2015), M. Ziembicki (participant).

[Con10] *1st URSI Atlantic Radio Science Conference: URSI AT-RASC* (Gran Canaria, Spain, May 18-25, 2015) M. Darmetko (speaker).

[Con11] *The 9th International Conference on Computer Recognition Systems: CORES 2015* (Wrocław, Poland, May 25-27, 2015), P. Płoński (participant).

[Con12] *6th International Conference on Emerging Technologies in Non-destructive Testing* (Brussels, Belgium, May 27-29, 2015), B. Salski (participant).

[Con13] *17th Photonics North Conference* (Ottawa, Canada, Jun. 9-11, 2015), B. Salski (participant).

[Con14] *International Conference devoted to the memory of prof. R. Frackowiak* (Lozanne, Switzerland, Jun. 11-13, 2015), E. Piątkowska-Janko, P. Bogorodzki (participants).

[Con15] *Vision Understanding and Machine Intelligence Summer School 2015* (Porto, Portugal, Jul. 2-5, 2015), D. Grzywczak (participant).

[Con16] *British Machine Vision Association Summer School* (Swansea, UK, Jul. 5-10, 2015), M. Kowalski (participant).

[Con17] *The International Conference on New Photo-Detectors: PD'15* (Moscow, Troitsk, Russia, Jul. 6-9, 2015), A. Rychter (participant).

[Con18] *Non-intrusive Load Monitoring Conference: NILM 2015* (London, UK, Jul. 7-10, 2015), P. Bilski (speaker).

[Con19] *IMEKO XXI World Congress 2015* (Prague, Czech Republic, Aug. 30-Sept. 4, 2015), R. Z. Morawski (member of the Advisory Board, Technical Board, Editorial Board, General Council), W. Winiecki, P. Bilski, P. Mazurek, J. Wagner (participants).

[Con20] *International Symposium on Dynamic Nuclear Polarization* (Egmont Aan Zee, the Netherland, Aug. 31 - Sept. 4, 2015), P. Bogorodzki (participant).

[Con21] *7th International Symposium on Process Tomography* (Dredsen, Germany, Sept. 1-5, 2015), W. Smolik, J. Kryszyn (participants).

[Con22] *European Microwave Conference: EuMC 2015* (Paris, France, Sept. 6-11, 2015), J. Modelski (chair of session, member of the European Microwave Week Steering Committee, General Assembly European Microwave Association).

[Con23] *36th ESA Antenna Workshop on Antennas and RF Systems for Space Science* (Noordwijk, the Netherland, Oct. 6-9, 2015), P. Bajurko (participant).

[Con24] *2015 Fifth International Conference on e-Learning* (Manama, Kingdom of Bahrain, Oct. 18-20, 2015), J. Modelski (speaker).

[Con25] *International Conference on 3D Vision* (Lyon, France, Oct. 19-22, 2015), M. Kowalski (speaker).

[Con26] *42 Międzynarodowa Konferencja i Wystawa: PIKE 2015: „W Stronę Jednolitego Rynku Cyfrowego"* (42nd International Conference and Exhibition: PIKE 2015: Towards a Digital Single Market) (Kraków, Poland, Oct. 19-22, 2015), J. Modelski (president of the Program Council).

[Con27] *2015 IEEE Nuclear Science Symposium & Medical Imaging Conference* (San Diego, USA, Oct. 31 – Nov. 7, 2015), M. Ziembicki, A. Rychter (participants).

[Con28] *IEEE TENCON 2015* (Macau, China, Nov. 1-4, 2015), M. Góralczyk (speaker).

[Con29] *23rd Telecommunications Forum: TELFOR 2015* (Belgard, Serbia, Nov. 23-26, 2015), J. Kołakowski, V. Djaja-Jośko (speakers).

[Con30] *9 Międzynarodowe Forum Innowacyjne Technologie dla Medycyny: ITMED 2015* (Supraśl, Poland, Dec. 3-5, 2015), K. Zaremba (member of the Programme Committee, session chair).

[Con31] *IEEE MTT-S International Microwave and RF Conference: IMaRC 2015* (Hyderabad, India, Dec. 10-12, 2015), J. Modelski (panelist, judge of the SIGT Student Design Contest, speaker).

9.3. National scientific events

[Con32] *XV Sympozjum Świata Telekomunikacji i Mediów* (XVth Symposium on Telecommunication World and Media) (Warsaw, Poland, Mar. 25-26, 2015), J. Modelski (participant).

[Con33] *Krajowa Konferencja Radiokomunikacji, Radiofonii i Telewizji* (National Conference on Radiocommunications and Broadcasting) (Łódź, Poland, Apr. 8-10, 2015), J. Modelski, W. Skarbek, Y. Yashchyshyn, J. Cichocki (members of the Programe Committee, speakers), J. Kołakowski, T. Kosiło, P. Miazga, R. Michnowski, A. Badawika, V. Djaja-Jośko, T. Karpisz, P. Piasecki, M. Berezowska, M. Kołakowski, P. Symonides, P. Włodarczyk, J. Wiśniewska (speakers).

[Con34] *Ogólnopolska Konferencja Operatorów Komunikacji Elektronicznej-PIKE 2015* (National Conference on Electronic Communications Operators-PIKE 2015) (Toruń, Poland, May 11-12, 2015), J. Modelski (speaker).

[Con35] *XIV Krajowa Konferencja Elektroniki: KKE 2015* (XIVth National Conference on Electronics) (Darłówko Wschodnie, Jun. 8-12, 2015), W. Gwarek, D. Gryglewski, W. Kazubski, J. Modzelewski, W. Wojtasiak, M. Góralczyk, M. Mikołajewski, D. Kuchta (participants).

[Con36] *Krajowe Sympozjum Telekomunikacji i Teleinformatyki: KSTiT 2015* (National Seminar on Telecommunications and Teleinformatics) (Kraków, Poland, Sept. 16-18, 2015), J. Modelski, W. Skarbek (members of the Programe Committee).

[Con37] *Krajowa Konferencja Metody Heurystyczne i Algorytmy Ewolucyjne* (National Conference on Heuristic Methods and Evolution Algorithms) (Sulejów, Poland, Sept. 16-18, 2015), P. Miazga (speaker).

[Con38] *XIX Krajowa Konferencja Naukowa: Biocybernetyka i Inżynieria Biomedyczna* (XIXth National Scientific Conference Biocybernetics and Biomedical Engineering) (Warsaw, Poland, Oct. 14-16, 2015), P. Bogorodzki, W. Obrębski, M. Szczepankowski, M. Wieteska (participants).

[Con39] *8 Konferencja Urządzenia i Systemy Radioelektroniczne* (8 Conference Devices and Radioelectronic Systems) (Warsaw, Poland, Oct. 27-29, 2015), J. Modelski (member of the Programme Committee, panelist).

[Con40] *VIII Konferencja Naukowo-Techniczna "Otwarty Rynek Kolejowy w Polsce" – Konkurencyjność Kolei Dużych Prędkości* (VIIIth Open Railway Market in Poland – the Competitiveness of High-Speed Railway) Warsaw, Poland, Nov. 05, 2015), J. Modelski (member of the Programme Board), *Konwergencja radiokomunikacji i technik multimedialnych w inteligentnym transporcie* (Convergation of Radiocommunication and Multimedia Technology in the Intelligent Transport), the presentation given by J. Modelski, T. Kosiło (participant).

[Con41] Konferencja Naukowo-Techniczna: "Wpływ Bezprzewodowych Technologii Teleinformatycznych na Życie Współczesnego Człowieka" (ICT Wireless Impact on Modern Man) (Warsaw, Poland, Nov. 25, 2015), Radiokomunikacja w dobie multimediów (Radiocommunication in Time of Multimedia) the presentation given by J. Modelski, Lokalizacja w pomieszczeniach – zastosowanie standardu Bluetooth Smart (Indoor Localization – Bluetooth Smart Standard Application), the presentation given by T. Kosiło.

[Con42] *XVI Seminarium Stypendystów Fundacji Wspierania Rozwoju Radiokomunikacji i Technik Multimedialnych* (XVIth Seminar Scholarship Holders' of Foundation for the Development of Radiocommunications and Multimedia Technology) (Warsaw, Dec. 9, 2015), G. Pastuszak, D. Grzywczak, M. Kowalski, R. Protasiuk, P. Piotrowski, A. Wójcik, Sz. Wójtowicz, M. Ziemek (speakers).

10. AWARDS AND DISTINCTIONS

State Medals

Kajetana Snopek, D.Sc.,
Jerzy Kołakowski, Ph.D.

Medal Komisji Edukacji Narodowej (Medal of National Education Commitee).

Przemysław Miazga, Ph.D.,
Andrzej Miękina, Ph.D.

Medal Złoty za Długoletnią Służbę (Golden Medal for Long-lasting Service).

Awards granted by international bodies

European Microwave Association Distinguished Service Award

Józef Modelski, Prof. D.Sc.

Individual award for the outstanding achievements to the European microwave community.

IEEE Instrumentation and Measurement Society
Roman Z. Morawski, Prof. D.Sc.

Outstanding Reviewer of *IEEE Transactions of Instrumentation and Measurement*

The IET Innovation Award 2015

Bartłomiej Salski, D.Sc.

Team award for Comp-Health Consortium

Huawei Technologies

Piotr Włodarczyk, B.Sc.

Award in *Seeds for the Future* competition

INTEL Corporation

Piotr Płoński, M.Sc.
Award for the best application on the use of INTEL RealSense technology

Awards granted by the Warsaw University of Technology (WUT)

Golden Graduates' Book of WUT
Józef Modelski, Prof. D.Sc.

Awards of the Rector

Wojciech Gwarek, Prof. D.Sc.,
Yevhen Yashchyshyn, Prof. D.Sc.,
Piotr Bilski, D.Sc.,
Bartłomiej Salski, D.Sc.,
Kajetana Snopek, D.Sc.

Individual awards for the scientific achievements

Krzysztof Zaremba, Prof. D.Sc.,
Wiesław Winiecki, Prof. D.Sc.

Individual awards for the organizational achievements

Roman Z. Morawski. Prof.D.Sc.

Team I^{o} award for his work in Jury of the Young Scientist Medal (Kapituła Medalu Młodego Uczonego)

Józef Modelski, Prof. D.Sc.,
Jacek Cichocki, Ph.D.,
Anna Czarnecka, M.Sc.,
Konrad Godziszewski, M.Sc.,
Krystian Ignasiak, Ph.D.,
Sebastian Kozłowski, Ph.D.,
Ryszard Michnowski, Ph.D.,
Kajetana Snopek, D.Sc.,
Stanisław Żmudzin, M.Sc.,

Team award for the organization of National Conference on Radiocommunications and Broadcasting (KKRRiT 2014)

Award of the students of the Faculty

Bartłomiej Salski, D.Sc.,
Tymon Rubel, Ph.D.

"Golden Chalk" Award

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

Piotr Włodarczyk, B.Sc.

The second award for the paper titled: *"Szyk antenowy dla standardu 802.11a\h\n\ac"* (802.11a\h\n\ac Antenna Array Standard).

Marcin Kołakowski, B.Sc.

The preference paper titled: *"Źródło sygnału w ultraszerokopasmowym systemie lokalizacyjnym"* (Signal Source in UWB Localization System).

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

For preparing D.Sc. Thesis

G. Pastuszak

For preparing Ph.D. Thesis

A. Abramowski
G. Brzuchalski
A. Łysiuk

For preparing M.Sc. Thesis

M. Berezowska
P. Piotrowski
R. Protasiuk
K. Stanik
A. Wójcik
S. Wójtowicz
N. Zienkowicz

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

SPECIFICATION	2012	2013	2014	2015
academic staff [posts]				
total	64,55	60,68	60,68	60,23
tenured professors	4,5	5	6	5,5
professors	9	7,5	5,5	5,5
associate professors	1	0	2,75	5
assistant professors	41,65	39,90	37,90	33,65
readers	2,25	1	1	1
senior lecturers	3,5	4,53	4,53	4,08
assistants	2,65	2,75	3	5,5
Ph.D. students [persons]				
total	34	42	39	45
regular, the third level studies	19	30	28	34
without scholarship	15	12	11	11
technical and administrative staff [posts]				
total	17,6	19,75	17,25	17,75
senior R&D associates	2,5	1,75	1,25	1,25
R&D associates	4	5,5	5,5	5
administrative associates	9,1	10,5	9,5	9,5
service workers	2	2	1	2
temporary staff (projects: Proteus, Lider, ENIAC)	6,8	4,3	0	0
library resources				
books (volumes)	11140	11165	11181	11197
books (titles)	7251	7276	7292	7307
journals (subscribtions)	83	83	83	83
teaching activities				
basic courses	69	69	61	61
advanced courses	34	34	35	34
other courses	51	54	47	47
international projects, courses and lectures	2	3	3	4
research activities				
total	44	47	46	48
international	4	5	6	3
granted by Ministry	19	22	22	21
granted by the University	15	12	11	17
other	6	8	7	8
titles and degrees awarded				
Prof. titles	1	2	0	0
D.Sc. degrees	1	0	3	3
Ph.D. degrees	7	8	5	5
M.Sc. degree (regular studies + evening studies)	66+3	61+7	62+2	63+2
M.Sc. degree (studies in English)	-	1	1	1
B.Sc. degrees (regular studies + evening studies)	123+7	106+3	98+4	69+5
B.Sc. degrees (studies in English)	4	3	2	2
B.Sc. degrees (distant learning)	4	1	2	2
publications				
total	172	183	215	205
sci.-tech. books and chapters in books	5	7	8	2
sci.-tech. papers in journals - total	54	77	83	89
JCR-ICI list (IF>0)	26	36	44	33
MSHE list	27	38	36	52
in other journals	1	3	3	4
sci.-tech. papers in conference proceedings	95	74	83	81
other publications	18	25	41	33
research reports	28	29	19	24
scientific events attended by the staff	46	35	46	42

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 and Multimedia Technology.

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