INSTITUTE OF RADIOELECTRONICS

WARSAW UNIVERSITY OF TECHNOLOGY

FACULTY OF ELECTRONICS AND INFORMATION TECHNOLOGY

ANNUAL REPORT

2009

Warsaw, February 2010

From the Director

Welcome to the 2009 edition of our Annual Report!

We are presenting to You the new edition of our Annual Report which, in a condensed form, is displaying the effects of another year of hard work and dedication in the Institute of Radioelectronics.

Our Institute's scientific output brought forward in the 2009 edition of the Report, allows me to state that we still keep national foothold within the areas of radiocommunications, microwave technique as well as antennae and multimedia techniques. The evidence of our leading position in these fields were, for example, the choice of our Institute as the organizer of this year's edition of the annual domestic conference – KKRRiT, as well as the presence of our staff in managing and steering bodies of numerous world-renown organizations, such as the IEEE or IMEKO. Many of our researchers also act in scientific committees of journals and national as well as international conferences (see Chapters 2-9). Personally, I was honoured to be appointed to the position of the IEEE Region's 8 Director, which now gives me new opportunities for serving the radioelectronics community and promoting the Institute on the international arena.

2009 was another year during which the new educational reform at the Faculty of Electronics and Information Technologies was being implemented. The details of the above-mentioned teaching offer are presented in Chapter 3. With unconcealed satisfaction, we observed a vivid and distinct increase of interest among graduates and students, and a dynamic expansion that our new field of study – "Biomedical Engineering" enjoyed in 2009. This is even more satisfying as the teaching staff of our Institute played a leading role in its development. Last year our Institute also placed great weight on the active participation in the international student exchange programs, such as SOCRATES or ATHENS. Also, our didactic activity focused strongly on the process of awarding of diplomas. In 2009, 87 B.Sc. and 67 M.Sc. theses were defended (see Chapter 5). Our professional staff still enjoy exceedingly high opinion and interest among the students as well as the representatives of the world academia. As a result in 2009 Prof. Krzysztof Zaremba was awarded *Golden Chalk* distinction for the best lecturer at our Faculty.
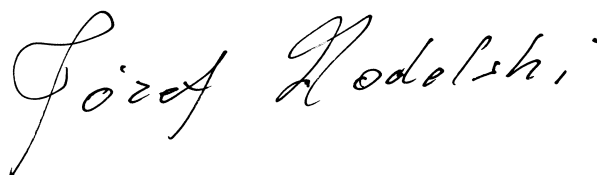
We would like to pay your special attention to Chapter 4 of our Annual Report, which summarizes our strong activity in the area of R&D projects and to Chapter 6, which contains the documentation of this activity in form of a list of publications. In the past few years, our focus area was centered around international cooperation, within the framework of which we carried out several projects of the 6th and 7th European Framework Programmes, as well as a few projects in partnership with prestigious world-known companies. The effects of the above-mentioned cooperation are seen in, e.g. the development of DOCSIC 3.0 standard, which enables the realization of very fast transmission of data in cable networks, and which was developed within the framework of the European project – CODMUCA. The above-mentioned standard was implemented in 2009, and is currently widely used by the key operators in the cable TV sectors around Europe and in the USA. In 2009, there was a switch of our works towards big implementation projects, such as the EU Specific Targeted Research Project PROTEUS.

In the near future, we are expecting the launch of a new research front being the consequence of state authorities' decision concerning building of the nuclear power plants in Poland.

Such vivid activity in both, the research and didactics, would not have been possible without our highly qualified staff. The recognition of their hard work and involvement found its reflection in many individual awards and distinctions which they received in 2009 (the complete list can be found in Chapter 10).

I would like to sincerely thank all the workers of the Institute of Radioelectronics for their deep involvement, hard work and dedicated service in support of the Institute.

Warsaw, February 2010

Professor Józef Modelski

Contents

This Annual Report summarizes the research activities
of the Institute in 2009, as well as the teaching activities
of the academic year 2008/2009

1   GENERAL INFORMATION

1.1   Mission of the Institute

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

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

As researchers, we are faithful to the highest standards of the Faculty and the University. We also feel quite unique due to an extremely broad spectrum of addressed subjects, which comprise:
- electromagnetic and acoustic field theory, acoustic and electromagnetic wave generation and propagation,
- signal theory, processing, coding, transmission, with regard to electronic, electroacoustic, and TV signals,
- radio transmitting and receiving,
- radiocommunication terrestrial and satellite systems,
- physical phenomena in radio engineering, acoustic, nuclear engineering, and medical systems,
- biomedical signal analysis, medical imaging, medical informatics,
- X-ray, MR, and emission tomography,
- detection and spectrometry of radiation,
- analysis and synthesis of electronic systems,
- intelligent multimedia systems and multimedia converged (video, data, and voice),
- measuring methods and systems,
- analysis, measurement, and estimation of sound and image distortion.

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

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

1.2 Board of Directors

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1.3 Organization of the Institute

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

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

The structure of the Institute also includes Library, Financial Section, and Supply Section.

1.3.1 Electroacoustics Division

Head of Division

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Senior academic staff

Wiesław Winiecki, D.Sc., Professor
Jan Żera, D.Sc., Associate Professor (0.5)
Piotr Bilski, Ph.D., Assistant Professor (0.5, from March)
Piotr Bobiński, Ph.D., Assistant Professor
Ewa Kotarbińska, Ph.D., Assistant Professor (0.5)
Robert Łukaszewski, Ph.D., Assistant Professor
Krzysztof Mroczek, Ph.D., Assistant Professor
Maria Tajchert, Ph.D., Assistant Professor

Junior academic staff

Aleksandra Młyńska, M.Sc., Assistant (0.5)

Technical staff

Piotr Bilski, Ph.D., Senior Devel. Eng. (0.5, till March)
Andrzej Leszczyński, Ph.D., Senior R&D Eng. (0.5, from March)
Piotr Nykiel, M.Sc., Senior Development Engineer

Ph.D. students

Paweł Czernik, M.Sc., from Oct. 2008
Rafał Korycki, M.Sc., from Feb. 2007
Marcin Lewandowski, M.Sc., from Feb. 2008
Jakub Olszyna, M.Sc., from Feb. 2008

Retired:

Andrzej Aronowski
Jerzy Narkiewicz-Jodko, Ph.D.

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

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

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

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

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

1.3.2 Microwave and Radiolocation Engineering Division

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Małgorzata Celuch, Ph.D., Assistant Professor

Daniel Gryglewski, Ph.D., Assistant Professor

Paweł Kopyt, Ph.D., Assistant Professor

Przemysław Miazga, Ph.D., Assistant Professor

Maciej Sypniewski, Ph.D., Assistant Professor

Andrzej Więckowski, Ph.D., Assistant Professor

Wojciech Wojtasiak, Ph.D., Assistant Professor

Jolanta Zborowska, Ph.D., Assistant Professor

Krzysztof Robaczyński, M.Sc., Senior Lecturer (0.5)

Technical staff

Krzysztof Robaczyński, M.Sc., Senior R&D Engineer (0.5)

Mirosław Lubiejewski, Foreman

Ph.D. students

Michał Grabowski, M.Sc., from Feb. 2007

Piotr Konczak, M.Sc., from Oct. 2009

Dawid Rosołowski, M.Sc., from Oct. 2005

Bartłomiej Salski, M.Sc., from Feb. 2006

Michał Sołtysiak, M.Sc., from Oct. 2007

Michał Żebrowski, M.Sc., from Oct. 2008

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 2009 included: design of high-frequency systems for radio-communication 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 imple-

mentation 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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Roman Szabatin, Ph.D., Docent

Piotr Bogorodzki, Ph.D., Assistant Professor

Grzegorz Domański, Ph.D., Assistant Professor

Marian Kazubek, Ph.D., Assistant Professor (0.5)

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

Błażej Sawionek, Ph.D., Research Assist. Prof. (0.95 from Nov. 2009)

Waldemar Smolik, Ph.D., Assistant Professor

Tomasz Jamrógiewicz, M.Sc., Senior Lecturer

Tomasz Olszewski, M.Sc., Senior Lecturer

Junior academic staff

Marcin Ziembicki, M.Sc., Assistant (0.5)

Technical staff

Andrzej Wasilewski, Worker

Joanna Witkowska, Senior Technician till Nov., Specialist from Dec.

Ph.D. students

Stanisław Adaszewski., M.Sc., from Feb. 2009

Piotr Czarnecki, M.Sc., from Oct. 2007

Michał Dziewiecki, M.Sc., from Oct. 2005

Karolina Kamińska, M.Sc., from Feb. 2009

Łukasz Kołaszewski, M.Sc., from Feb. 2009

Wojciech Obrębski, M.Sc., from Oct. 2008

Lech Raczyński, M.Sc., from Oct. 2006

Andrzej Smolnik, M.Sc., from Oct. 2008

Krzysztof Woźniak, M.Sc., from Oct. 2006

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;
- 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.
- a new contrast media for MRI: functional lung imaging with hyper-polarized He3, Xe129.

1.3.4 Radiocommunications Division

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Jacek Wojciechowski, Prof. D.Sc., Tenured Professor

Jacek Cichocki, Ph.D., Docent

Tomasz Kosiło, Ph.D., Docent

Tomasz Buczkowski, Ph.D., Assistant Professor

Krzysztof Czerwiński, Ph.D., Assistant Professor

Krzysztof Derzakowski, Ph.D., Assistant Professor

Wojciech Kazubski, Ph.D., Assistant Professor

Tomasz Keller, Ph.D., Assistant Professor

Jerzy Kołakowski, 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

Marian Piasecki, Ph.D., Research Assist. Prof. (0.95 from July 2009 till Dec. 2010)

Karol Radecki, Ph.D., Assistant Professor

Kajetana Snopek, Ph.D., Assistant Professor

Zbigniew Walczak, Ph.D., Assistant Professor (till Feb.)

Henryk Chaciński, M.Sc., Senior Lecturer

Junior academic staff

Marek Bury, M.Sc., Assistant (0.5, from Feb.)

Technical staff

Anna Czarnecka, M.Sc., Senior Admin. Specialist

Jacek Jarkowski, Ph.D., Senior R&D Engineer (0.25)

Marek Marcinkowski, Senior Foreman

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

Ph.D. students

Kamil Bryłka, M.Sc., from Oct. 2006

Maria Magdalena Czajko, M.Sc., from Oct. 2008

Marcin Dąbrowski, M.Sc., from Oct. 2006

Andrzej Dominik, M.Sc., from Oct. 2004

Cezary Jezierski, M.Sc., from Oct. 2007

Piotr Makal, M.Sc., from Feb. 2008

Andrzej Piętak, M.Sc., from Oct. 2008

Paweł Ziętek, M.Sc., from Oct. 2006

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 radio 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;
- wireless ultra-wideband systems (UWB) – methods and systems for communication and localization, systems for road safety, microwave imaging systems;
- antennas and radio channel – electrodynamic modeling and design of various types of microwave, millimeter, submillimeters wavelengths and terahertz antennas, including electronically controlled and reconfigurable antennas, photonic antennas, integrated 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;
- radio frequency devices – high-efficiency resonant power amplifiers (class D, DE, E, F and G), linear wideband short-wave amplifiers, high-power amplitude modulators, high-efficiency power supplies, power factor correctors, low-noise amplifiers, microwave filters and phase shifters;
- digital radio broadcasting systems – medium- and short-wave DRM transmitters and receivers;
- theory of signals and modulations – multidimensional Hilbert transform and its applications, "time- frequency" transformations for radio-frequency 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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Krystian Ignasiak, Ph.D., Assistant Professor
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Tomasz Krzymień, M.Sc., Senior Lecturer

Junior academic staff
Rafał Jóźwiak, M.Sc., Assistant (0.75)

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Ph.D. students
Mariusz Jakubowski, M.Sc., from Oct. 2008
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Agata Latała, M.Sc., from Oct. 2006
Mariusz Leszczyński, M.Sc., from Oct. 2005
Jacek Naruniec, M.Sc., from Oct. 2006
Artur Nowakowski, M.Sc., from Feb. 2006
Grzegorz Ostrek, M.Sc., from Oct. 2008
Aleksandra Rachocka, M.Sc., from Oct. 2009

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. The Division continues its efforts in the development of MPEG standards (MPEG-4 and MPEG-7). The staff of the division actively works in Multimedia Technical Committee no. 288 at Polish National Committee for Standardization. The Technical Committee is hosted at the Institute of Radioelectronics.

Specific research topics in 2009 included:
- video and audio compression;
- intelligent multimedia systems.

Telemedicine group extends the area of multimedia applications to teleradiology, e-health and computer-aided diagnosis systems. Fundamentals of medical imaging, image analysis and processing, soft computing for decision support, information theory and codes are used for the following research topics:
- image-based teleconsultations and telediagnosis;
- computer-assisted diagnosis for mammography, chest radiography;
- brain imaging and computer assistance of stroke diagnosis;
- computer assistance of abdominal CT examinations;

- ultrasound imaging sound 3D visualization systems;
- digital bronchoscopy supporting system;
- medical information systems (RIS/PACS);
- image and universal compression;
- multiscale data representation and analysis;
- data indexing and retrieval.

Developed projects were integrated to tele-information systems in close collaboration with leading medical centers.

The laboratory named *Digital Processing of Measurement Signals* is active in the field of measurement science and technology. Its research activities are focused on improving the quality of measurements by means of digital signal processing. The current research topics include:
- general-purpose algorithms for reconstruction of measurands and for calibration of measuring channels;
- spectrophotometric analyzers for applications in industrial and environmental monitoring;
- portable sound-and-vibration analyzers for applications in technical diagnostics and in the environmental monitoring.

1.4 Evening Studies and Continuing Education

1.4.1 M.Sc. Evening Studies on Radiocommunications and Multimedia Technologies

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Jacek Cichocki, Ph.D.,
Sławomir Kula, Ph.D.,
Marek Rusin, Ph.D.

1.4.4 Studies on Radiocommunications, Multimedia Technologies and Biomedical Engineering "RADEM"

Head

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1.4.5 Studies on Audiological Techniques

Head

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1.5 Other Institute's Units

1.5.1 Library

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1.5.2 Accounting Department

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Staff

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[Edu85];
[Pro11], [Pro24], [Pro38];
[MSc2], [MSc27];
[BSc27], [BSc63];
[Pub24], [Pub39], [Pub171], [Pub174], [Pub177], [Pub178], [Pub180], [Pub181], [Pub182], [Pub183], [Pub184], [Pub185].

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[Edu31], [Edu69];

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[Pub2], [Pub20], [Pub23], [Pub91], [Pub94], [Pub134], [Pub173], [Pub189], [Pub190].

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[Edu30], [Edu33], [Edu72], [Edu80];
[Pro23], [Pro36], [Pro45];
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[Edu10], [Edu48], [Edu99], [Edu116], [Edu117], [Edu124], [Edu131], [Edu146];
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M.Sc. ('78), Ph.D. ('01); medical and nuclear engineering; **Assistant Professor**, Nuclear and Medical Electronics Division.
Member of Center of Excellence PROKSIM ('04-); tutorial assistance of Biomedical and Nuclear Engineering Students Scientific Group ('06-), and Beskid Mountain Guides Student Circle (-99'); qualification levels PRINCE2 Foundation ('09-)..
[Edu36], [Edu77];
[Pro11], [Pro24], [Pro33], [Pro38];
[MSc6], [MSc11], [MSc25], [MSc60];
[BSc6];
[Pub24], [Pub56], [Pub174], [Pub177], [Pub178], [Pub180], [Pub181], [Pub182], [Pub183], [Pub184], [Pub185].

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M.Sc. ('75), Ph.D. ('83); measurement and instrumentation; **Assistant Professor**, Television Division.
[Edu9], [Edu34], [Edu42], [Edu43];
[Pro13], [Pro31];
[MSc17].

Artur Przelaskowski
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M.Sc. ('90), Ph.D. ('95), D.Sc. ('04); computer-aided diagnosis in medicine, telemedicine, multimedia techniques, signal & image processing, data compression, imaging informatics; **Professor,** Television Division.
Member of the International Scientific Board of Advances in International Telemedicine and e-Health ('06-); Tutorial assistance of Technique in Medicine Student Scientific Group ('08-).
[Edu14], [Edu71], [Edu75];
[Pro14], [Pro28];
[MSc23], [MSc30], [MSc42];
[BSc24], [BSc43], [BSc47], [BSc50], [BSc65], [BSc68];
[Pub3], [Pub7], [Pub8], [Pub11], [Pub25], [Pub26], [Pub85], [Pub86], [Pub87], [Pub101].

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M.Sc. ('70), Ph.D. ('78); radio-frequency engineering and measurement; **Assistant Professor**, Radiocommunications Division.
Member of the National Committee of URSI ('90-); Member of the Programme Committee of the National Symposium of Radio Science ('99-); National Chairman of URSI Commission of Electromagnetic Metrology ('90-); Member of the Scientific Advisory Board, Polish Association for the Blind ('95-).
[Edu60], [Edu106], [Edu120], [Edu130];
[Pro26];
[MSc62];
[BSc54];
[Pub88].

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M.Sc. ('96), Ph.D. (automatics '01), Ph.D. (medical science '06); mathematical modeling of physiological and disease processes, biostatistical methods, experiments design methods; **Assistant Professor**, Nuclear and Medical Electronics Division.
Rector's Deputy for Handicapped Persons at WUT ('05-).
[Pro12], [Pro24];
[Pub11], [Pub30], [Pub31], [Pub186], [Pub187], [Pub188].

Krzysztof Robaczyński
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M.Sc. ('69); microwave technique; **Senior Lecturer** (0.5), Microwave and Radiolocation Engineering Division.
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[Edu93];
[Pro23]; [Pro46].

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M.Sc. ('72), Ph.D. ('76), D.Sc. ('91); Prof. Title ('01); microwave technique; **Professor**, Microwave and Radiolocation Engineering Division.
[Edu11], [Edu65];
[Pro23].

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M.Sc. ('66), Ph.D. ('75); radiocommunications, television; **Assistant Professor** (0.5), Television Division.
President of the Board of European Sport Radio-orienteering Federation ('00-);
[Edu12], [Edu55].

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M.Sc. ('72), Ph.D. ('77), D.Sc. ('94); Prof. Title ('03); information technology, image processing, digital media; **Tenured Professor**, Television Division, Head ('00-).
Head of Multimedia Technical Committee no. 288 at Polish Committee for Standardization ('99-); ISO /S.C.29/WG11 (MPEG) expert ('00-); Member of Advisory Board of *Image Processing and Communications* ('95-), *Fundamenta Informaticae* ('06-), *"Optoelectronics Review"* ('06-).
[Edu64], [Edu67], [Edu84], [Edu86];
[Pro4], [Pro14], [Pro32], [Pro37], [Pro40], [Pro41],[Pro48];
[MSc35];
[BSc40], [BSc52], [BSc57];
[Pub13], [Pub29], [Pub42], [Pub58], [Pub59], [Pub82], [Pub92], [Pub98], [Pub99], [Pub103], [Pub108], [Pub159].

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M.Sc. ('91), Ph.D. ('97); biomedical engineering, computer engineering; **Assistant Professor**, Nuclear and Medical Electronics Division.
[Edu44], [Edu47], [Edu70], [Edu107];
[Pro9], [Pro12], [Pro24], [Pro35];
[BSc4];
[Pub30], [Pub89], [Pub160], [Pub191].

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M.Sc. ('91), Ph.D. ('02); signal and system theory and applications; **Assistant Professor**, Radiocommunications Division.
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[Edu56], [Edu60], [Edu120], [Edu128];
[Pro29];
[BSc53], [BSc74];
[Pub93].

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[Edu46];
[Pro23];
[MSc29];
[Pub97].

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M.Sc. ('70), Ph.D. ('82); biomedical engineering; **Docent**, Nuclear and Medical Electronics Division.
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[Edu36], [Edu88];
[Pro9], [Pro24], [Pro35];
[MSc43];
[BSc9], [BSc59];
[Pub89], [Pub131].

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M.Sc. ('69), Ph.D. ('78); electroacoustics, acoustic measurements, architectural acoustics; **Assistant Professor**, Electroacoustics Division.
Member of the Polish Acoustics Society ('70-); Member of the Audio Engineering Society ('91-); Treasurer of the Audio Engineering Society Polish Section ('07-).
[Edu59], [Edu89], [Edu144], [Edu145];
[Pro21];
[MSc45];
[BSc2], [BSc5].

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M.Sc. ('98), Ph.D. ('02); radio networks, heuristics methods, radiocommunications; **Assistant Professo**r, Radiocommunications Division.
[Pro1], [Pro30];
[MSc39], [MSc66];
[Pub83].

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M.Sc. ('70), Ph.D. ('80); microwaves, computer engineering, measurements; **Assistant Professor**, Microwave and Radiolocation Engineering Division.
[Edu46];
[MSc19];
[BSc15], [BSc39].

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M.Sc. ('75), Ph.D. ('86), D.Sc. ('03); measurement and instrumentation; **Professor**, Electroacoustics Division.

Deputy Director for Research of the Institute of Radioelectronics ('08-); Member of the WUT Science Council ('06-); Member of the Senate Committee on Research ('05-); Member of the Metrology and Instrumentation Committee, Polish Academy of Sciences ('07-); President of the Polish Society for Measurement, Automatic Control and Robotics POLSPAR ('04-); Member of the Scientific and Programme Committee of the National Conferences: SP ('01-), KM ('06-), PD ('06-), MWK ('08-), and International Conference IEEE IDAACS ('01-); Member of the IEEE IDAACS International Advisory Board; Reviewer of the *IEEE Transactions on Instrumentation and Measurement* ('03-) and *Measurement – Journal of IMEKO* ('08-); Member of the Editorial Board of the *International Journal of Computing* ('06-); Guest Editor of the Special Issue of the International Journal *Sensors and Systems* ('09-'10); Member of Programme Board of the Journal *Pomiary Automatyka Kontrola* ('07-); Silver Badge of the Minister of Sport and Tourism for the Merits in Sport ('09); Warsaw University of Technology, Person of Merit ('09).

[Edu35], [Edu57], [Edu79], [Edu97];

[Pro22];

[Pub61], [Pub114], [Pub120], [Pub121], [Pub122], [Pub125].

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

Member of the Circuit Theory and Signal Processing Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('97-); Member of the Scientific Committees of: International Conference on Signals and Electronics Systems ('97-), Conference on Evolutionary Algorithms and Global Optimization ('97-); Coordinator of the cooperation agreement between WUT and University of Waterloo, Canada ('93-); Adviser to Wydawnictwo Komunikacji i Łączności – a publishing house in engineering ('97-); Associate Editor of *Journal of the Franklin Institute* ('07-).

[Edu21], [Edu56], [Edu83], [Edu125];

[Pro30];

[PhD3];

[MSc34];

[BSc17];

[Pub37], [Pub45], [Pub46], [Pub83], [Pub106], [Pub107]; [Pub129].

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M.Sc. ('84), Ph.D. ('98); microwave technique; **Assistant Professor**, Microwave and Radiolocation Engineering Division.

[Edu37], [Edu122];

[Pro7], [Pro8], [Pro15], [Pro17], [Pro23], [Pro42], [Pro43], [Pro44], [Pro45];

[MSc41];

[Pub53], [Pub78], [Pub90], [Pub133], [Pub164].

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e-mail: E.Jaszczyszyn@ire.pw.edu.pl

M.Sc. ('79), Ph.D. ('86), D.Sc. ('06); antennae and antenna array; **Professor**, Radiocommunications Division, Head ('09-).

Member of the Organizing Committee of the International Conference TCSET ('98-); Reviewer of the *IEEE Transactions on MTT"* ('04-), *IEEE Transactions on AP* ('06-) and *IEEE Microwave and Wireless Components Letters* ('04-); Member of Editorial Board of Izwestiya Wuzow Radioelektronika ('09-); Member of the Microwave and Radiolocation Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('07-); Member of IEEE ('96-), Member of EuMA and EurAAP ('08-), TPC Member of the MIKON ('09-), Member of the Scientific and Programme Committee of the National Conference KKRRiT ('09-).

[Edu2], [Edu66];

[Pro2], [Pro3], [Pro7], [Pro25], [Pro50].

[MSc16], [MSc51];

[BSc19];

[Pub32], [Pub34], [Pub35], [Pub36], [Pub104], [Pub116], [Pub117], [Pub130], [Pub165], [Pub166], [Pub167], [Pub168], [Pub169], [Pub170], [Pub197].

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M.Sc. ('81), Ph.D. ('90), D.Sc. ('03); biomedical engineering, nuclear electronics; Professor, Nuclear and Medical Electronics Division, Head ('03-).

Member of CERN ('89-); Head of the Warsaw Branch of Polish Society of Medical Physics ('01-); Head of the Dean's Financial Committee ('02-); Member of the Faculty Accreditation Board ('07-); Member of the University Council Committee on Property and Finances ('05-); Member of the Board and Treasurer of the Polish Society of Medical Physics ('05-); Member of the Scientific Committee of the National Symposium on Biomedical Engineering and Telemedicine "IBITEL" ('06-), Member of the Programme Committee of the International Forum of Innovative Technologies for Medicine ITMED ('07-), Member of the Programme Committee of IEEE International Workshop on Medical Measurements and Applications IEEE MeMeA ('07-), Member of the Editorial Advisory Board of the *Polish Journal of Medical Physics and Engineering* ('07-), Head of the Area of Concentration Electronics and Information Technology in Medicine ('06-); Deputy Chairman of the Board of the Center for Imaging and Biomed-

ical Research ('06-); Member of the Biomedical Engineering Commission of the Committee on Medical Physics, Radiobiology and Image Diagnostics PAN ('08-); Member of the Board of Polish Eastern Medical Cluster ('08-); Faculty Coordinator of Faculty Development ('08-); Faculty Coordinator of Area of Studies Biomedical Engineering ('08-); University Coordinator of Area of Studies Biomedical Engineering ('09-); "Golden Chalk Award" ('09).
[Edu52], [Edu68];
[Pro5], [Pro6], [Pro19], [Pro24], [Pro39], [Pro47];
[PhD4], [PhD5];
[MSc36], [MSc53], [MSc65];
[BSc20], [BSc66], [BSc72];
[Pub13], [Pub14], [Pub15], [Pub16], [Pub132], [Pub162].

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M.Sc. ('74), Ph.D. ('83); microwave technique; **Assistant Professor**, Microwave and Radiolocation Engineering Division.
[Edu37];
[Pro23].

Jan Żera
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M.Sc. ('76), Ph.D. ('90), D.Sc. ('04); acoustics, electroacoustics, psychoacoustics, noise control; **Associate Professor**, Electroacoustics Division.
Member of the ISO Working Group – ISO/TC 159/S.C5/WG3 ('97-); Member of Polish Acoustical Society ('78-), European Acoustics Association ('01-), Acoustical Society of America ('90-); Member of the Committee on Acoustics, the Polish Academy of Sciences ('07-); Member of Scientific Council of the Central Institute for Labour Protection – National Research Institute ('09-), Member of Technical Committee KT 105: Electroacoustics of Polish Committee for Standardization ('09-).
[Edu5], [Edu40], [Edu147];
[Pro20], [Pro21];
[BSc18], [BSc29], [BSc36];
[Pub75], [Pub144], [Pub145], [Pub175], [Pub176], [Pub179], [Pub192].

2.2 Junior academic staff

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

Ph.D. Student	*(tutor)*
Stanisław Adaszewski., M.Sc.	*(K. Zaremba)*
Kamil Bryłka, M.Sc.*	*(Y. Yashchyshyn)*
Maria Magdalena Czajko, M.Sc.*	*(J. Wojciechowski)*
Piotr Czarnecki, M.Sc.	*(K. Zaremba)*
Paweł Czernik, M.Sc.	*(W. Winiecki)*
Marcin Dąbrowski, M.Sc.*	*(J. Modelski)*
Michał Dziewiecki, M.Sc.	*(J. Marzec)*
Michał Grabowski, M.Sc.	*(S. Rosłoniec)*
Mariusz Jakubowski, M.Sc.*	*(W. Skarbek)*
Magdalena Jasionowska, M.Sc.	*(A. Przelaskowski)*
Cezary Jezierski, M.Sc.*	*(J. Modelski)*
Marcin Jędryka, M.Sc.*	*(W. Skarbek)*
Rafał Jóźwiak, M.Sc.	*(A. Przelaskowski)*
Karolina Kamińska, M.Sc.	*(K. Zaremba)*
Łukasz Kołaszewski, M.Sc.	*(K. Zaremba)*
Piotr Konczak, M.Sc.	*(W. Gwarek)*
Rafał Korycki, M.Sc.*	*(Z. Kulka)*
Agata Latała, M.Sc.*	*(R. Z. Morawski)*
Mariusz Leszczyński, M.Sc.*	*(W. Skarbek)*
Marcin Lewandowski, M.Sc.	*(Z. Kulka)*
Piotr Makal, M.Sc.	*(J. Modelski)*
Jacek Naruniec, M.Sc.*	*(W. Skarbek)*
Artur Nowakowski, M.Sc.*	*(W. Skarbek)*
Wojciech Obrębski, M.Sc.	*(K. Zaremba)*
Jakub Olszyna, M.Sc.	*(W. Winiecki)*
Grzegorz Ostrek, M.Sc.	*(A. Przelaskowski)*
Andrzej Piętak, M.Sc.	*(J. Wojciechowski)*
Aleksandra Rachocka, M.Sc.	*(A. Przelaskowski)*
Lech Raczyński, M.Sc.	*(K. Zaremba)*
Dawid Rosołowski, M.Sc.	*(T. Morawski)*
Bartłomiej Salski, M.Sc.	*(W. Gwarek)*
Andrzej Smolnik, M.Sc.*	*(K. Zaremba)*
Michał Sołtysiak, M.Sc.	*(W. Gwarek)*
Krzysztof Woźniak, M.Sc.*	*(K. Zaremba)*
Paweł Ziętek, M.Sc.*	*(J. Modelski)*
Michał Żebrowski, M.Sc.	*(S. Rosłoniec)*

• – without scholarship

2.4 Technical and administrative staff

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3 TEACHING ACTIVITIES (academic year 2008/2009)

3.1 Regular studies – Areas of Focus:

Radiocommunications and Multimedia Technologies

Head

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Electronics and Information Technology in Medicine

Head

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

3.1.1 Basic Courses

[Edu1] *Analysis of Measurement Data in Medicine* (Analiza danych pomiarowych w medycynie – ADP); 45h/sem.; B. Konarzewski.

[Edu2] *Antennae and Radio-wave Propagation* (Anteny i propagacja fal – AIPF); 45h/sem.; Y. Yashchyshyn.

[Edu3] *Basic Radio-frequency Circuits* (Podstawowe układy radioelektroniczne – PURAD); 45h/sem.; J. Modzelewski, W. Kazubski.

[Edu4] *Basics of Electroacoustics* (Podstawy elektroakustyki – PEL); 45h/sem.; P. Bobiński.

[Edu5] *Basics of Hearing and Sound Perception* (Podstawy słyszenia i percepcja dźwięku – PSPD); 30h/sem.; J. Żera.

[Edu6] *Basics of Medical Imaging Techniques* (Podstawy technik obrazowania w medycynie – PTOM); 60h/sem.; P. Brzeski.

[Edu7] *Basics of Microelectronics – Lab.* (Podstawy mikroelektroniki – PMK); 30h/sem.; T. Olszewski, K. Mroczek.

[Edu8] *Basics of Microprocessor Technique* (Podstawy techniki mikroprocesorowej – TMIK); 60h/sem.; K. Czerwiński, B. Konarzewski, K. Derzakowski, T. Krzymień.

[Edu9] *Basics of Programming* (Podstawy programowania – PRM); 60h/sem.; A. Podgórski.

[Edu10] *Basics of Radiocommunications* (Podstawy radiokomunikacji – PR); 30h/sem.; T. Kosiło.

[Edu11] *Basics of Radiolocation and Radionavigation* (Podstawy radiolokacji i radionawigacji – PRIR); 45h/sem.; S. Rosłoniec.

[Edu12] *Basics of Television* (Podstawy telewizji – POTE); 45h/sem.; M. Rusin.

[Edu13] *Broadcasting Systems* (Systemy radiofoniczne – SYR); 45h/sem.; H. Chaciński.

[Edu14] *Computer Graphics* (Grafika komputerowa – GRK); 30h/sem.; A. Przelaskowski.

[Edu15] *Computer Systems* (Systemy komputerowe – SYKO); 45h/sem.; T. Jamrógiewicz.

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

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

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

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

[Edu20] *Digital Circuits – Lab.* (Układy logiczne; laboratorium – ULOGE); 30h/sem.; G. Domański, B. Konarzewski, T. Olszewski.

[Edu21] *Digital Communications* – EDICO; 60h/sem.; J. Wojciechowski (English-medium studies).

[Edu22] *Digital and Interactive Television* (Telewizja cyfrowa i interaktywna – TCI); 60h/sem.; elective; A. Buchowicz.

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

[Edu24] *Diploma Seminar for Graduate Students 1* (Seminarium dyplomowe magisterskie 1 – SDM2); 30h/sem.; Z. Kulka, J. Modelski, P. Brzeski.

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

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

[Edu27] *Electronic Circuits Supply* (Zasilanie układów elektronicznych - ZUE); M. Mikołajewski, J. Modzelewski.

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

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

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

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

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

[Edu33] *Introduction to Electronics, Informatics and Telecommunications* (Wstęp do elektroniki, informatyki i telekomunikacji – WEIT); 15h/sem.; W. Gwarek.

[Edu34] *Introduction to Numerical Methods* (Wstęp do metod numerycznych – WDMNM); 45h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski.

[Edu35] *Measurement Systems* (Systemy pomiarowe – SPOM); 30h/sem.; W. Winiecki.

[Edu36] *Medical Electronic Instrumentation* (Elektroniczna aparatura medyczna – EAME); 60h/sem.; T. Olszewski, R. Szabatin, T. Jamrógiewicz, E. Piątkowska-Janko.

[Edu37] *Microwave Technique (*Technika mikrofalowa – TMO); 60h/sem.; J. Zborowska, W. Wojtasiak.

[Edu38] *Multimedia Standards and Algorithms* (Algorytmy i standardy multimedialne – ASM); 45h/sem.; G. Galiński.

[Edu39] *Multi-service and Multimedia Networks* – EMSMN; 60h/sem.; T. Keller (English-medium studies).

[Edu40] *Music Acoustics* (Akustyka muzyczna – AM); 30h/sem.; J. Żera.

[Edu41] *Noise Control* (Ochrona przed hałas – OPH); 30h/sem.; E. Kotarbińska.

[Edu42] *Numerical Methods* – MNUB; 45h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski (Biomedical Engineering).

[Edu43] *Numerical Methods* – ENUME; 60h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski (English-medium studies).

[Edu44] *Object-oriented Programming M* (Programowanie obiektowe M – PROBI); 60h/sem.; W. Smolik.

[Edu45] *Object-oriented Programming of Multimedia Applications in Java (*Java – obiektowe programowanie aplikacji multimedialnych – OPA); 45h/sem.; K. Ignasiak.

[Edu46] *Operating Systems* (Systemy operacyjne – SOE); 15h/sem.; M. Sypniewski, A. Więckowski.

[Edu47] *Programming Languages* (Języki programo–wania - JPJ); 75h/sem.; W. Smolik.

[Edu48] *Radiocommunication Systems* (Systemy radiokomunikacyjne – SRKO); 45h/sem.; T. Kosiło.

[Edu49] *Radioelectronics Measurements (*Miernictwo radioelektroniczne – MR); 45h/sem.; J. Cichocki.

[Edu50] *Radio Networks and Systems* (Systemy i sieci radiowe – SISR); 45h/sem.; T. Keller.

[Edu51] *Radiological Apparatus in Medical Diagnostics* (Aparatura radiologiczna w diagnostyce medycznej – ARDM); 30h/sem.; G. Domański.

[Edu52] *Radiology and Nucleonics* (Radiologia z nukleoniką – RN); 45h/sem.; K. Zaremba.

[Edu53] *Radio Transmitting Technique and its Applications* (Technika nadawania radiowego i jej aplikacje – TNR); 60h/sem.; J. Modzelewski.

[Edu54] *Satellite Communications* (Łączność satelitarna – ŁS); 45h/sem.; K. Kurek.

[Edu55] *Selected Problems of Modern Television* (Wybrane zagadnienia współczesnej telewizji – WZWT); 30h/sem.; M. Rusin.

[Edu56] *Signals and Systems* (Sygnały i Systemy – SYST); 60h/sem.; J. Wojciechowski, K. Snopek.

[Edu57] *Software for Measuring Systems* (Oprogramowanie systemów pomiarowych – OSP); 60h/sem.; W. Winiecki, P. Bobiński.

[Edu58] *Software for Medical Systems (*Oprogramowanie systemów medycznych – OSM); 45h/sem.; R. Kurjata.

[Edu59] *Receiving and Forming of Sound* (Odbiór i kształtowanie dźwięku – OKD); 45h/sem.; M. Tajchert.

[Edu60] *Signals and Modulations* (Sygnały i modulacje – SYGM); 45h/sem.; K. Snopek, K. Radecki.

[Edu61] *Study Audio Techniques – Lab.* (Dźwiękowa technika studyjna – DTS); 15h/sem.; R. Korycki.

[Edu62] *Ultrasonography Instrumentation* (Aparatura ultrasonograficzna – AUS); 45h/sem.; M.Kazubek.

[Edu63] *UMTS System (System UMTS – UMTS);* 45h/sem.; J. Kołakowski, J. Cichocki.

3.1.2 Advanced courses

[Edu64] *Adaptive Image Recognition* – EADIR; 60h/sem.; W. Skarbek (English-medium studies).

[Edu65] *Analysis and Synthesis of Microwave Circuits* (Analiza i synteza układów mikrofalowych – ASUM); 45h/sem.; S. Rosłoniec.

[Edu66] *Antennae Theory and Design* (Teoria i projektowanie anten – TPA); 60h/sem.; Y. Yashchyshyn.

[Edu67] *Applied Geometry* (Geometria stosowana – GS); 60h/sem.; W. Skarbek.

[Edu68] *Artificial Neural Networks in Medicine* (Sztuczne sieci neuronowe w medycynie – SESN); 45h/sem.; K. Zaremba.

[Edu69] *Computional Electromagnetics for Telecommunications* – ECOET; 60h/sem.; M. Celuch (English-medium studies).

[Edu70] *Computed Tomography* (Tomografia komputerowa – TOM); 60h/sem.; W. Smolik.

[Edu71] *Computer - Aided Medical Image Diagnostics* (Komputerowe wspomaganie obrazowej diagnostyki medycznej – KWOD); 45h/sem.; A. Przelaskowski.

[Edu72] *Computer Analysis of Electrodynamics Problems* (Komputerowa analiza problemów elektrodynamiki – KAPE); 45h/sem.; W. Gwarek.

[Edu73] *Contemporary Heuristic Techniques* – ECOHT; 60h/sem.; P. Bilski (English-medium studies).

[Edu74] *Contemporary Heuristic Techniques* (Współczesne techniki heurystyczne – WMH); 60h/sem.; P. Bilski.

[Edu75] *Data Compression* (Kompresja danych – KODA); 45h/sem.; A. Przelaskowski.

[Edu76] *Digital Audio Signal Processing* (Cyfrowe przetwarzanie sygnałów fonicznych – CPSF); 45h/sem.; Z. Kulka.

[Edu77] *Digital Image Processing* (Cyfrowe przetwarzanie obrazów – CPOO); 30h/sem.; M. Kazubek, P. Brzeski, E. Piątkowska-Janko.

[Edu78] *Digital Transmission of Information* (Cyfrowa transmisja informacji – CTIN); 45h/sem.; T. Buczkowski.

[Edu79] *Distributed Measurement Systems* (Rozproszone systemy pomiarowo-kontrolne – RSPK); 45h/sem.; W. Winiecki, R. Łukaszewski.

[Edu80] *Electromagnetic Compatibility* (Kompatybilność elektromagnetyczna – KE); 30h/sem.; W. Gwarek.

[Edu81] *Ethical Aspects of Legal Protection of Intellectual Property* (Etyczne aspekty prawnej ochrony własności intelektualnej – S13); 15h/sem.; R. Z. Morawski

[Edu82] *Evolutionary Algorithms* – EEVAL; 60h/sem.; P. Miazga (English-medium studies).

[Edu83] *Graphs and Networks* (Grafy i sieci – GIS); 30h/sem.; elective; J. Wojciechowski.

[Edu84] *Image and Audio Semantic Analysis (*Analiza semantyczna obrazu i dźwięku – ASOD); 45h/sem; W. Skarbek.

[Edu85] *Magnetic Resonance Imaging* (Tomografia rezonansu magnetycznego – TRM); 45h/sem.; P. Bogorodzki.

[Edu86] *Multimedia Indexing* (Indeksowanie multimediów – INM); 60h/sem.; W. Skarbek.

[Edu87] *Noise and Electromagnetic Interference in Electronics Devices* (Szumy i zakłócenia w aparaturze elektronicznej – SZAE); 30h/sem; J. Marzec.

[Edu88] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej – TMN); 60h/sem.; R. Szabatin.

3.2 Special courses

3.2.1 Engineer Degree Evening Studies on Radiocommunications and Multimedia Technologies

[Edu89] *Acoustic Techniques* (Techniki dźwiękowe – TDRM); 30h/sem.; semester 7; M. Tajchert.

[Edu90] *Antennae* (Anteny – ANM); 30h/sem.; semester 4; H. Chaciński.

[Edu91] *Basics of Computer Techniques* (Podstawy techniki komputerowej – PKOM); 45h/sem.; semester 1; R. Kurjata.

[Edu92] *Basics of Fiberglass Technique* (Podstawy techniki światłowodowej – PTSRM); 45h/sem.; semester 3; L. Lewandowski.

[Edu93] *Basics of High-Frequency Techniques* (Podstawy techniki w.cz. – PTWM); 60h/sem.; semester 3; K. Robaczyński.

[Edu94] *Basics of Logical Circuits and Microprocessor Technique* (Układy logiczne i podstawy techniki mikroprocesorowej – PULM); 60h/sem.; semester 4; K. Czerwiński, K. Derzakowski.

[Edu95] *Basics of Satellite Communications* (Podstawy łączności satelitarnej – SATM); 15h/sem.; semester 4; K. Kurek.

[Edu96] *Circuits and Signals* (Obwody i sygnały – OSRM); 45h/sem.; semester 2; K. Czerwiński.

[Edu97] *Computer Control and Data Processing* (Komputerowe sterowanie i przetwarzanie danych – KSTM); 45h/sem.; semester 5; W. Winiecki.

[Edu98] *Digital Cellular Systems* (Cyfrowe systemy komórkowe – CSKM); semester 7; 36h/sem.; J. Cichocki.

[Edu99] *Digital Signals Transmission* (Cyfrowa transmisja sygnałów – CTSM); 45h/sem.; semester 5; T. Kosiło.

[Edu100] *Diploma Seminar* (Seminarium dyplomowe – SDM); 15h/sem.; semester 6; T. Morawski.

[Edu101] *Diploma Seminar 2* (Seminarium dyplomowe 2 – SD2M); 15h/sem.; semester 7; T. Morawski.

[Edu102] *Electronic Circuits* (Układy elektroniczne – UEM); 45h/sem.; semester 3; D. Gryglewski.

[Edu103] *Fields and Waves* (Pola i fale – PFM); 60h/sem.; semester 2; T. Morawski.

[Edu104] *Imaging Techniques* (Techniki obrazowe – TORM); 30h/sem.; semester 7; M. Kazubek.

[Edu105] *Internet Techniques* (Techniki internetowe – TINM); 30h/sem.; semester 7; K. Ignasiak.

[Edu106] *Materials and Elements* (Materiały i elementy – MEM); 15h/sem.; semester 4; K. Radecki.

[Edu107] *Multimedia Applications* (Aplikacje multimedialne – AMRM); 15h/sem.; semester 5; W. Smolik.

[Edu108] *Multimedia Computer Systems* (Multimedialne systemy komputerowe – MSKM); 30h/sem.; semester 4; T. Jamrógiewicz.

[Edu109] *Multimedia Techniques* (Techniki multimedialne – TMM); 15h/sem.; semester 6; G. Galiński.

[Edu110] *Numerical and Statistical Techniques* (Techniki obliczeniowe i symulacyjne – TOSM); 30h/sem.; semester 4; A. Miękina.

[Edu111] *Programmable Digital Devices* (Programowalne układy cyfrowe – PUCM); 30h/sem.; semester 5; T. Olszewski.

[Edu112] *Programming* (Programowanie – PMRM); 30h/sem.; semester 3; R. Kurjata.

[Edu113] *Project 1* (Projekt 1 – PJUM); 30h/sem.; semester 5; P. Brzeski.

[Edu114] *Project 2* (Projekt 2 – PSRM); 60h/sem.; semester 6; P. Brzeski.

[Edu115] *Propagation of Waves* (Propagacja fal – PFAM); 15h/sem.; semester 4; K. Kurek.

[Edu116] *Radiocommunication Systems 1* (Systemy radiokomunikacyjne 1 – SRKM); 60h/sem.; seme-ster 6; T. Kosiło.

[Edu117] *Radiocommunication Systems 2* (Systemy radiokomunikacyjne 2 – SRK2M); 30h/sem.; seme-ster 7; T. Kosiło.

[Edu118] *Radiodiffusion Systems* (Systemy radiodyfuzyjne – SRDM); 60h/sem.; semester 6; A. Buchowicz, H. Chaciński.

[Edu119] *Radioelectronics Measurements* (Miernictwo radioelektroniczne – MRM); 45h/sem.; semester 5; J. Cichocki.

[Edu120] *Signals and Modulations* (Sygnały i modulacje – SMRM); 60h/sem.; semester 3; K. Snopek, K. Radecki.

[Edu121] *Technique of Emission and Receiving* (Technika emisji i odbioru – TEM); 45h/sem.; semester 4; J. Modzelewski, W. Kazubski.

3.2.2 M.Sc. Evening Studies on Radiocommunications and Multimedia Technologies

[Edu122] *Analysis and Synthesis of Microwave Units* (Analiza i synteza układów mikrofalowych – ASUMW); 60h/sem.; semester 2; W. Wojtasiak.

[Edu123] *Computer Systems* (Systemy komputerowe – SMKW)*;* 30h/sem.; semester 2; T. Jamrógiewicz.

[Edu124] *Designing of Radiocommunication Systems* (Projektowanie systemów radiokomunikacyjnych – PSRW); 60h/sem.; semester 3; T. Kosiło.

[Edu125] *Digital Signals Processing* (Cyfrowe przetwarzanie sygnałów – CPSW); 75h/sem.; semester 1; J. Wojciechowski, Z. Kulka.

[Edu126] *Digital Transmission of Information* (Cyfrowa transmisja informacji – CTIW); 75h/sem.; semester 2; T. Buczkowski.

[Edu127] *Diploma Seminar* (Seminarium dyplomowe – SDMW); 30h/sem.; semester 4; J. Ebert.

[Edu128] *Numerical Methods* (Metody numeryczne – MNW); 30h/sem.; semester 2, K. Snopek.

[Edu129] *Programming in Java Language* (Programowanie w języku Java – PJJW); 45h/sem.; semester 1; K. Ignasiak.

[Edu130] *Radio Navigation Systems* (Radiowe systemy nawigacyjne – RSNW); 45h/sem.; semester 4; T. Buczkowski, K. Czerwiński, K. Radecki.

[Edu131] *Radiocommunication Systems Design* (Projektowanie systemów radiokomunikacyjnych – PSRW); 60h/sem.; semester 3; T. Kosiło.

3.2.3 Studies on Radiocommunications, Multimedia Technologies and Biomedical Engineering "RADEM"

[Edu132] *Training in the Field of DVB-T, DVB-H* (Szkolenie z zakresu DVB-T, DVB-H); 18h, twice a year, T. Keller, M. Dąbrowski.

3.2.4 Studies on Audiological Techniques

Studies on Audiological Techniques offer a series of courses: 180h, twice a year.

[Edu133] *Anatomy and Physiology of Hearing* (Anatomia i fizjologia słyszenia); 12h.

[Edu134] *Audiometry* (Audiometria); 30h.

[Edu135] *Aural Rehabilitation* (Rehabilitacja); 7h.

[Edu136] *Basics of Acoustics* (Podstawy akustyki); 16h.

[Edu137] *Earmold Technics* (Wkładki douszne); 8h.

[Edu138] *Ear Pathology* (Patologia ucha); 9h.

[Edu139] *Elements of Psychology* (Elementy psychologii); 6h.

[Edu140] *Sign Languages and Cued Speech* (Język gestów); 8h.

[Edu141] *Hearing Aid Fitting* (Dobór aparatów słuchowych); 40h.

[Edu142] *Hearing Aid Measurements* (Miernictwo aparatów słuchowych); 14h.

[Edu143] *Hearing Aid Technology and Elements of Electronics* (Technika aparatów słuchowych i elementy elektroniki); 30h.

3.2.5 B.Sc. Level e-learning Special Courses

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

[Edu144] *Basics of Sound Technique* (Podstawy techniki dźwiękowej); 30h/sem.; Z. Kulka, A. Leszczyński M. Tajchert.

[Edu145] *Systems and Devices of Sound Technique* (Urządzenia i systemy techniki dźwiękowej); 30h/sem.; Z. Kulka, A. Leszczyński, M. Tajchert.

3.3 International co-operation

[Edu146] **SOCRATES Program: Higher Education**
T. Kosiło, T. Buczkowski,
1999 – 2009

Institute of Radioelectronics of the Warsaw University of Technology has a working bilateral SOCRATES agreement with Katholieke Hogeschool Sint-Lieven (KaHo), Gent, Belgium and Instituto Superior Tecnico, Universidade Tecnica de Lisboa, Lisbon, Portugal. Student Mobility actions were realized within the framework of Electronics and Telecommunication Engineering (Socrates code 06.05). The aim of the program is to realize a student project at the partner University.

[Edu147] Advanced Technology Higher Education Network / Socrates (**ATHENS**)

Within the Advanced Technology Higher Education Network / Socrates (ATHENS), the following courses were offered:
- "Ethical Aspects of Research and Engineering" was offered for 32 students, by R. Z. Morawski in the period: March 16-20, 2009;
- "Sound: Hearing and Acoustical Measurements" by J. Żera was offered for 29 students in the period: November 14-21, 2009;

All students who attended this course were from the following EU institutions of higher education:
- École Nationale Supérieure des Mines de Paris, Paris, France (Michael Fertin, Carl Hossler);
- École Nationale Supérieure des Télécommunications, Paris, France (Julien Bisiaux, Arnaud Blanchard, Gauthier Lherbier, Olivier Marcellin, Yohann Melamed, Raphael Simonnet, AmelieTorrents);
- École Supérieure de Physique et de Chimie Industrielles, Paris, France (Romain Denefle, Donatien Lefebvre de Rieux, Laurent Lermusiaux, Liana Ramiandrisoa, Younes Belahnech);
- Instituto Superior Técnico, Lisbon, Portugal (Eugenio Fernandes, Flavio Goncalves, Andre Melo Marques, Jose Santos);
- Katholieke Universiteit Leuven, Leuven, Belgium (Dieter Aerts, Jef Haest);
- Politechnika Warszawska, Warsaw, Poland (Michał Marczak);
- Politecnico di Milano, Milano, Italy (Andrea Cilona, Giacomo Marcolin, Giulia Suarato);
- Universidad Politécnica de Madrid, Madrid, Spain (Carlos Blanco, Jose Pablo Martinez Ortega, Shailendra Natraj, Ignacio Ortega, David Pereira, Pablo Prieto de Mingo, Pablo Ruiz-Ogarrio Gomez, Alvaro Sarasua Berodia).

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] **Co-operative Systems for Road Safety "Smart Vehicles on Smart Road".**
Tomasz Kosiło, J. Modelski, J. Kołakowski, R. Michnowski, J. Cichocki, P. Makal, Z. Walczak;
Jan. 1, 2006 – Dec. 31, 2009
SAFESPOT, EU Integrated Project (Partially funded by MSHE)

The key aspect of the project was to expand the time horizon for acquiring information relevant for safe driving, as well as to improve the precision, the reliability and the quality of the driver information, and to introduce new information sources. The time horizon of the SAFESPOT applications will allow for the extension of the "Safety margin", namely the time in which a potential accident is detected before it can occur, from the range of "milliseconds" up to "seconds". This extension, called "green area", will reduce the risk of the accident to happen as more time will be given to drivers to become aware of a potential danger, and to undertake the appropriate maneuvers.

[Pro2] **Reconfigurable Systems for Mobile Local Communications and Positioning.**
Józef Modelski, K. Kurek, Y. Yashchyshyn, R. Szumny, S. Kozłowski, P. Bajurko, M. Bury, A. Cichocki, P. Służewski;
Jan. 1, 2006 – Jan. 31, 2009
RESOLUTION, EU Specific Targeted Research Project (Partially funded by MSHE)

The aim of RESOLUTION was developing a wireless 3D local positioning system with high accuracy and real time ability. The system is intended to work in an environment with strong multipath effects and fading, and will be implemented in advanced CMOS technology. Institute of Radioelectronics is responsible for Work Package 3 (antennas and propagation) that considers modeling of the indoor multipath propagation channel and design of smart antenna arrays for the system.

[Pro3] **Integrated Mobile System for Counterterrorism and Rescue Operations** (Zintegrowany mobilny system wspomagający działania antyterrorystyczne i antykryzysowe).
J. Modelski, Y. Yashchyshyn, K. Kurek, T. Keller, G. Pastuszak, K. Derzakowski, M. Bury, A. Rudziński, S. Kozowski, P. Bajurko, B. Majewski, M. Darmento, M. Klocek, A. Kurek, R. Szumny, K. Bryłka, B. Sawionek, A. Abramowski, M. Wieczorek, M. Roszkowski, M. Jakubowski, M. Rodzik, A. Linkowski, G. Brzuchalski, M. Morgoś, R. Sikorał
Apr. 1, 2007 – Aug. 31, 2013
PROTEUS, EU Specific Targeted Research Project (Partially funded by MSHE)

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

[Pro4] **Networked Audiovisual Media Technologies.**
Władysław Skarbek; K. Ignasiak, A. Buchowicz, G. Galiński, K. Kucharski, K. Wnukowicz, M. Tomaszewski, M. Morgoś, S. Badura, M. Leszczyński
Jul. 1, 2006 – Jun. 30, 2009
VISNET II, EU Network of Excellence (Partially funded by MSHE)

VISNET II builds on the success and achievements of the VISNET network of excellence to continue the progress towards achieving the NoE mission of creating a sustainable world force in Networked Audiovisual (AV) Media Technologies. VISNET II is a network of excellence with a clear vision for integration, research and dissemination plans. The research activities within VISNET II cover 3 major thematic areas related to networked 2D/3D AV systems and home platforms. These are: Video Coding, Audiovisual Media Processing, Audiovisual Media Security and Protection. VISNET II brings together 12 leading European organizations in the field of Networked Audiovisual Media Technologies. The consortium consists of the organizations known for their proved track record as well as both, national and international reputation in audiovisual information technologies. VISNET II integrates a number of researchers who have made significant contributions to the advancement of this field of technology through standardization activities, international publications, conferences and workshops activities, patents as well as many other prestigious achievements. The 12 integrated organizations represent 7 European states spanning across a major part of Europe, thereby promising the efficient dissemination of resulting technological development and exploitation to larger communities.

4.2 Projects granted by the Ministry of Science and Higher Education (MSHE)

4.2.1 MSHE international grants

[Pro5] **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, R.Sulej M. Ziembicki;
COMPASS, International project realized in collaboration with the Soltan Institute for Nuclear Studies and Faculty of Physics, Warsaw University;
Oct. 30, 2007 – Oct. 30, 2010

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

the COMPASS experiment for the new physical program scheduled for 2010-2012.

[Pro6] **The Research of the Neutrino Oscillations – the Second Generation Experiment – Design of the Detector and Participation in the Data Acquisition in the T2K Experiment** (Badanie oscylacji neutrin – eksperyment drugiej generacji – budowa detektora i udział w pomiarach przeprowadzanych w eksperymencie T2K).
Krzysztof Zaremba, J. Marzec, M. Dziewiecki, G. Domański, B. Konarzewski, R. Kurjata, R.Sulej, M. Ziembicki;
T2K, International project realized in collaboration with the Faculty of Physics, Warsaw University, Andrzej Soltan Institute for Nuclear Studies, Institute of Nuclear Physics, Polish Academy of Sciences, Faculty of Physics and Astronomy, University of Wrocław, Faculty of Mathematics, Physics and Chemistry, Silesian University;
Oct. 30, 2007 – Oct. 30, 2010

The project is a part of the collaboration with the T2K experiment in Japan. The T2K is a component of the second generation long-baseline neutrino-oscillation experiment intended for studies of the nature of neutrinos and the effect of their oscillations. Artificial neutrino beam generated in the proton accelerator in Tokai is shot toward the 50-kT water Cherenkov detector, Super-Kamiomande, which is located about 1000 m underground in Kamioka mine and is 295 km away from Tokai. The Institute of Radioelectronics takes part in the design of SMRD (Side Muon Range Detector), which is the part of the near detector (ND280), located in Tokai, 280 m away from the target position, intended for measurements of the neutrino spectrum, contamination and interaction cross-sections before the oscillation.

4.2.2 Development grants

[Pro7] **Multi-antenna Broadband Radiocommunication and Radiolocation Systems** (Wieloantenowe szerokopasmowe systemy radiokomunikacyjne i radiolokacyjne).
Józef Modelski, W. Wojtasiak, D. Gryglewski, K. Kurek, Y. Yashchyshyn, S. Kozłowski, M. Bury, P. Bajurko, D. Rosołowski;
Mar. 23, 2007 – Sept. 22, 2009

The main aim of the project is the research and development process on the prototypes of multi-antenna transmitters and receivers constructions, for use in radiocommunication and radiolocation applications. In the project, mainly MIMO (Multiple Input Multiple Output) techniques are used, in connection with multidimensional electrical and thermal modeling of the microwave semiconductor devices.

[Pro8] **Design of High Power Microwave Devices with SiC and GaN Components** (Projektowanie mikrofalowych urządzeń dużej mocy z elementami SiC i GaN).
Wojciech Wojtasiak, D. Gryglewski, M. Lubiejewski;
Oct. 2, 2007 – Oct. 1, 2010

The aim of the project is to design the high-temperature high-power microwave devices including DC supply blocks with use of SiC MESFET, GaN HEMT and low frequency SiC components such as MOSFET, and rectifying Schottky diodes. The design procedures will be supported by multidimensional electro-thermal modeling and measurement techniques to determine frequency characteristics and thermal response of active elements. Within the framework of the project intended tasks are:

- high-temperature AC-DC and DC-DC converters with efficiency higher than 85%,
- high power microwave amplifiers of up to 100 W output power level for L and S-band,
- the measurement systems of temperature response of Sic and GaN devices.

The results of project will be put into practice in telecommunication companies and by the producers of military equipments. The project is the joint venture of Institute of Radioelectronics WUT and Electronic Department of Technical University of Koszalin.

[Pro9] **Multi-plane Capacitance Tomograph for Flow Speed Measurement** (Wielopłaszczyznowy tomograf pojemnościowy do pomiaru prędkości przepływu).
Roman Szabatin, P. Brzeski, W. Smolik, T. Olszewski, J. Mirkowski, A. Pląskowski, P. Czarnecki;
Oct. 11, 2007 – Apr. 10, 2010

The aim of the project is to elaborate, construct and verify an electrical capacitance tomograph, of very high position resolution, which will be working in real time. As a result, images (2D or 3D) of gas and liquid flow will be presented.

4.2.3 Research grants

[Pro10] **The Development of Electroacustic Method for Detection of Xylophagic Insects Destructive for Wooden Structures and Products** (Opracowanie elektroakustycznej metody wykrywania ksylofagicznych owadów niszczących drewniane konstrukcje i wyroby).
Adam Krajewski, Z. Kulka, P. Bobiński, P. Witomski, A. Oleksiewicz, M. Nowakowska;
Jul. 27, 2008 – Jul. 27, 2010

The primary objective of the project is to develop efficient methods for the registration of acoustic signals produced by the xylophagic (wood-feeding) insect larvae. The next objective is to develop and implement advanced data processing algorithms for recorded signals analysis. The results of the analysis should help to identify the presence of larvae in wooden structures and to estimate their numbers.

[Pro11] **A fMRI Study of the Patients Recovering from the Stroke** (Badania czynnościowe fMRI chorych usprawnianych po udarze mózgu)
Piotr Bogorodzki, E. Piątkowska-Janko;
Jul. 27, 2008 – Sept. 17, 2011

The aim of the project is to bulid and test a set of devices improving the accessibility of fMRI examinations from stroke disabled patients. This covers electronic gloves for finger tapping paradigm monitoring and pneumatic 'hand' which supports finger movements for muscle paresisi patients.

[Pro12] Iterative Algorithms for Tomograph Image Reconstruction with Modification of Sensitivity Matrix (Iteracyjne algorytmy rekonstrukcji obrazów tomograficznych z modyfikowaniem macierzy czułości).
Waldemar Smolik, D. Radomski;
Oct. 9, 2007 – Jan. 8, 2009

The goal of this project was the development of iterative algorithms for image reconstruction. It is necessary to use such algorithms as: ART and SIRT. These algorithms will be implemented to improve the quality of object imaging.

[Pro13] Methods and Algorithms of Measurement Data Processing for Applications in Spectrophotometric Analyzers (Metody i algorytmy obróbki danych pomiarowych dla zastosowań w analizatorach spektrometrycznych).
Roman Z. Morawski, A. Miękina, A. Podgórski;
Nov. 30, 2006 – Oct. 30, 2009

Spectrophotometric analyzers are on the rise, both in terms of the growing number of their applications and in terms of the growing number of their models available on the market. Today, they are applied not only for qualitative and quantitative identification of (bio)chemical substances, but also for evaluation of the nutritional properties of food and beverages, as well as for testing commercial parameters of textiles, construction materials and paper products. Any spectrophotometric analyzer is composed of a spectrophotometric transducer, a source of optical radiation, an output interface and a digital signal processor. During last decade, many miniature spectrophotometric transducers have appeared on the market. Their availability and relatively low prices open the prospects for developing a new class of personal analyzers of food, water, gasoline, atmospheric conditions, etc. The key problems to be solved now are related to the methods and algorithms of spectrophotometric data processing. The project is aimed at the development of the complex methodology for spectrophotometric data processing dedicated to spectrophotometric analyzers, mainly to NIR analyzers of food and beverages.

[Pro14] Acute Ischemic Stroke Detection based on Non-Contrast CT Examinations: Computer-based Methods of Hipodensity Processing, Extraction and Visualization (Detekcja wczesnych udarów niedokrwiennych mózgu z wykorzystaniem komputerowych metod przetwarzania, ekstrakcji i wizualizacji informacji z badań anatomicznych TK).
Artur Przelaskowski, U. Fiszer, W. Skarbek, T. Bulski, K. Sklinda, M. Kazubek;
May 10, 2007 – Jan. 31, 2009

Ischemic stroke is the clinical syndrome of rapid onset of focal, or sometimes global, cerebral deficit with a vascular cause, lasting more than 24 hours or leading to death. Infarction may occur in any area of the brain following vascular territory or watershed distribution. Brain imaging is required to guide the selection of acute interventions to treat patients with a stroke, which is very important for the stroke emergency centers. The recent advent of thrombolytic therapy for acute stroke treatment makes as early as possible detection of areas of hypoattenuating ischemic parenchyma exceedingly important. For most cases, CT remains the most important brain imaging test.

The most frequent and reliable signs of irreversible ischemic injury is a focal hypodense area (i.e. with density lower than normal brain tissues), in cortical, subcortical, or deep gray or white matter. However, on the initial CT-scan, performed during the hyperacute phase of stroke (0-6 h), the subtle hypodensity does not have to be seen because of artifacts, noise and other tissue abnormalities.

[Pro15] Design of Semiconductor T/R Module for X-band, as Part of the External Project: Advanced Radar Technologies in Military and Civilian Application (Opracowanie projektu półprzewodnikowego modułu nadawczo-odbiorczego w paśmie X w ramach projektu zamawianego: Zaawansowane technologie radarowe w zastosowaniach wojskowych oraz cywilnych).
Tadeusz Morawski, D. Gryglewski, W. Wojtasiak, M. Lubiejewski;
Nov. 7, 2007 – Nov. 6, 2010
Commissioned Research Project

The main aim of the project is the realization of universal T/R modules for X-band providing control over such parameters as: pulse duration, pulse delay with respect to the triggering signal, tunable operation point for transistors in power amplifiers. T/R modules are applicable for radiolocation systems of both the older (e.g. with electronic beam steering) and the newer generation, in which experiments with the new shape of pulse will be possible, thanks to the SDR (software defined radio) idea. The most basic problem during the designing process of the device is related to the design of the high power amplifier, precisely (in the present case) with GaAs FET transistors, thermal delays of duration (very short) comparable with a radiolocation pulse. The project consists of several tasks, the main of which is to design and realize a universal T/R module. Other tasks concern: the optimization of receiving input circuits with respect to noise level and durability, making power supply and control block universal for SDR application. Completing these tasks is going to allow for the compilation of general methodology to construct modern devices for professional radiolocation.

[Pro16] Digital Radio Broadcasting – Project Tools and Methods, Test Emissions (Radiofoniczne sieci cyfrowe, narzędzia i metody ich projektowania oraz emisje doświadczalne).
Jacek Jarkowski, K. Kurek, T. Keller, A. Dusiński E. Wielowieyska, J. Modzelewski, W. Kazubski, H. Chaciński;
Feb. 1, 2008 – Dec. 31, 2010
Commissioned Research Project

The aim of the project is the analysis of possibilities of realization of DRM (Digital Radio Mondiale) digital radio broadcasting in Poland on medium and short waves, with special attention to test emission. The analysis will consider technical aspects of realization of DRM test emission on medium and short waves: calculation of transmitter coverage, determination of transmitter locations for assumed coverage, necessary adaptation of existing transmitter objects for digital broadcasting. Realization of DRM test emission and design of cheap simple receivers is also anticipated by the project.

[Pro17] **Multi-band Transverter for 802.11 s Networks** (Wielopasmowy transwerter dla sieci mesh 802.11 s).
Wojciech Wojtasiak, D. Gryglewski;
Dec. 29, 2008 – Dec. 29, 2010
Commissioned Research Project

The aim of the projects is to develop a technology of transceiver modules in microwave bands: L,S,C and X. Those modules are supposed to have small size and weight as well as high efficiency to meet specific requirements for civil and military applications. In particular they need to comply with the NATO requirements for Polish military units. The deliverables of the project include a small, multi-band, energy-economical transceiver module for self-configurable network of the mesh 802.11s type. The project is run in cooperation with Radiotechnika Marketing sp z o.o

[Pro18] **Searching and Adaptation of Multimedia Data: Next Generation Services and Networks – Technical, Application and Market Aspects** (Wyszukiwanie i adaptacja danych multimedialnych w ramach projektu zamawianego pt. "Usługi i sieci teleinformatyczne następnej generacji – aspekty techniczne, aplikacyjne i rynkowe").
Andrzej Buchowicz, G. Galiński, K. Ignasiak, E. Dmoch;
Mar. 12, 2008 – Dec. 31, 2010
Commissioned Research Project

The main aim of the project is the analysis of methods for compression, streaming, search and adaptation of multimedia data. Special attention will be paid to video transcoding techniques as well as multimedia data search and retrieval based on MPEG-7 descriptors. In particular, the novel scalable and multiview video coding standards, currently under development within MPEG, protocols for multimedia data streaming, as well as multimedia data descriptors conforming to the MPEG-7 and MPEG-2 standards will be utilized in the project.

4.2.4 Ph.D. grants

[Pro19] **Development of Processing Methods for Quantitative Analysis of Proteomic Mass Spectrometry Data** (Rozwój metod przetwarzania danych w badaniach proteomicznych pod kątem analizy ilościowej).
Krzysztof Zaremba, T. Rubel;
Oct. 1, 2007 – Apr. 15, 2009

The aim of the project was to develop a mass spectrometry-based method for automated, label-free protein expression quantitation. The work covers all steps of the liquid chromatography-mass spectrometry (LC-MS) data processing, including MS/MS results collection and verification, raw MS spectra smoothing, model-based peak picking, normalization and multivariate statistical analysis. Special attention is paid to the feature selection and classification algorithms, which are essential for medical diagnostic applications.

[Pro20] **Low-and High-level Audio Descriptors in Sound Recognition for Databases** (Deskryptory niskiego i wysokiego poziomu w rozpoznawaniu dźwięku dla potrzeb baz danych).
Jan Żera, A. Świercz;
Jun. 9, 2008-Jun. 30. 2010

Low-level audio descriptors used in the MPEG-7 standard are based on statistical parameters that are only vaguely related to the mechanisms of hearing described in psychoacoustics. The aim of this project is to investigate, whether adding an auditory filter-bank model to the audio descriptor calculation scheme improves the overall algorithm effectiveness. Original and modified audio descriptors are evaluated using various kind of music samples.

4.3 Projects granted by the University

4.3.1 Statutory projects

[Pro21] **Design and Investigation of Electroacoustics Measuring Systems** (Projektowanie i badania systemów elektroakustycznych oraz systemów cyfrowego przetwarzania sygnałów fonicznych)
Zbigniew Kulka, P. Bobiński, E. Kotarbińska, A. Leszczyński, A. Młyńska, M. Tajchert, J. Żera;
Aug. 04, 2008 – Nov. 30, 2009

The first aim of the work was the analysis of Line Arras system of loudspeakers. Computer aided analysis of the straight-line, arc-line and J-shaped configurations showed the main characteristics in the function of the distance and radiation angle. The the second aim of the work was to present structures of digital filters used in frequency characteristics equalizers. Next, the work contains description of graphic equalizer implementation of two structures: parallel configuration of bandpass filters and serial configuration of peaking filters. The fixed and floating point implementations of the filter algorithm were discussed. The results of the measurements of all implemented structures were also presented. The third aim of the work was to create a device processing MIDI messages and sending them through other interfaces (mainly SPI). Main application for built device is to control evaluation boards with DSP processors using hardware MIDI consoles. Hardware and software design for the use of using virtual MIDI consoles written for PCs and transmission preview.

[Pro22] **Modern Methods of Computer Measuring Systems Designing** (Nowoczesne metody projektowania rozproszonych systemów pomiarowo-sterujących).
Wiesław Winiecki, K. Mroczek, P. Bilski, R. Łukaszewski, T. Daniluk, J. Olszyna;
Aug. 04, 2008 – Nov. 30, 2009

The project concerns the virtual instrumentation and distributed measuring systems. The results of the project include: the method of designing the real-time virtual instrumentation using ETS configuration and multi-core processors, analysis of the time efficiency assessment in the virtual measurement systems, algorithms and circuits for low power secured sensor networks with asymmetric computational resources, Large Number Library – the new LabView tool for secure measurement systems.

[Pro23] **Methods of Electromagnetic Modeling and Design of Transmit-receive Channels for High Frequency Systems** (Metody modelowania elektromagnetycznego i projektowania torów nadawczo-odbiorczych dla systemów wielkiej częstotliwości).
Wojciech Gwarek, T. Morawski, S. Rosłoniec,

M. Celuch, D. Gryglewski, M. Sypniewski, A. Więckowski, P. Kopyt, P. Miazga, W. Wojtasiak, J. Zborowska, K. Robaczyński, B. Salski, D. Rosołowski, M. Sołtysiak, M. Lubiejewski; Aug. 04, 2008 – Nov. 30, 2009

Electromagnetic modelling methods have been adapted for and utilized in various application domains. In particular, the generation of millimetre-wave in field-effect transistors has been investigated. Full-wave and hybrid modeling of optical problems has been performed. Methods of electromagnetic simulation and simulation-backed measurements for planar meta-materials have been developed. Electromagnetic properties of new cellular materials and mechanically chiral materials have been studied. Electromagnetic simulations have coupled with thermodynamic simulations for enhanced relevance to the microwave power industry. With a view to increasing complexity of the analyzed problems, methods of accelerating electromagnetic simulations on contemporary computer platforms have been explored. Methods of microwave amplifier design have been addressed, with a focus of field-effect high-power transistors. Such amplifiers have been utilized in novel transmit-receive channels.

[Pro24] **Modern Techniques in Nuclear and Medical Electronics** (Nowoczesne techniki elektroniki jądrowej i medycznej).
Krzysztof Zaremba, P. Bogorodzki, P. Brzeski, G. Domański, T. Jamrógiewicz, M. Kazubek, B. Konarzewski, J. Marzec, T. Olszewski, E. Piątkowska-Janko, D. Radomski, W. Smolik, R. Szabatin, R. Kurjata, A. Trybuła; Aug. 04, 2008 – Nov. 30, 2009

Analysis of visible and infrared light scattering in tissue
The aim of the work was to make an analysis of visible and infrared light scattering in tissue. The computer program was prepared for Monte Carlo simulation of photon migration in turbid tissue. A device for light intensity scattering measurement was elaborated.

A calibration system for auditory stimulation in fMRI examinations
The aim of this work was to develop the application for calibration of acoustic stimulus, which are stimulation in functional magnetic resonance studies. The created application called AudioStim allows for performing calibration in two ways: by set of tests suggested by BIRN or by audiometric tests.

Contrast Improvement in Head CT Images by Bilinear Filtering and Gray-Level Grouping
A two-stage method for contrast improvement of the head CT images was elaborated. In a first stage a bilinear filtering, which smooths images while preserving edges is used for noise elimination, next a method of histogram modification is applied. The proposed method increases over two times the contrast-to-noise ratio and has the potential to improve the detection and visibility of hypo-attenuating ischemic regions in patients with acute stroke.

Study of light transmission in scintillating fibers
Scintillating fiber detectors are often used in high energy physics experiment for tracking high momentum particles within the beam. The aim of the work was to extend already owned model of the detector and to modify it in order to be able to use parallel computing architecture

(MPICH2). Also, a preliminary model of MPPC detector was developed.

Electrical tomography techniques applied in medicine and industry
In the current year, the works on Electrical Capacitance Tomography (ECT) have been focused on developing of column installation for two-phase (gas-liquid) flow investigation. The installation was built in cooperation with Faculty of Chemical and Process Engineering.

[Pro25] **Measurement Procedures Dedicated for Modern Ultra-Wideband, Reconfigurable and Multi-antenna Systems** (Metody pomiarów nowoczesnych ultra-szerokopasmowych, rekonfigurowalnych oraz wieloelementowych systemów antenowych).
Yevhen Yashchyshyn, M. Dąbrowski, K. Bryłka, J. Modelski, K. Kurek, T. Keller, K. Derzakowski; Aug. 04, 2008 – Nov. 30, 2009

Tasks addressed during the research are related to antenna and radio-channel measurements in modern radio-systems. Modeling and designing of such systems require more complex mathematical description of the antennas than the one that is commonly in use. Other works related to this subject do not include detailed description of the measurement methods applicable for determination of the untypical antenna parameters. Therefore research was focused on the measurement problems. Presented results include measurement procedures for determination of the antenna pulse response (crucial parameter for some of the ultra-wideband systems), suggested approach for uncertainty states of reconfigurable and switched antennas and methods for determination of the transmission parameters in MIMO systems. Present document also contains results of the research on the measurement procedures for reconfigurable antennas. A problem of extending typical antenna description for reconfigurable antennas was stated and solved. Requirement for evaluation of the dynamical properties of switchable antennas was grounded. A method for pulse, time domain measurement for determination of parameters such as SWR and gain and their changes in time were devised and presented. A measurement setup based on the equipment available in professional antenna laboratories was proposed and appropriate mathematical model was devised. During the research, numerous measurement campaigns of the MIMO channel took place. Statistical distribution of symbol error rate were determined. Two detection algorithms and two modulation schemes were implemented in dedicated software package and applied.

[Pro26] **Receivers for Ultra-wideband Positioning Systems** (Układy odbiorcze w ultraszerokopasmowych systemach lokalizacyjnych).
Jacek Cichocki, J. Kołakowski, R. Michnowski, K. Radecki, W. Kiełek, S. Żmudzin, P. Makal, P. Ziętek; Aug. 04, 2008 – Nov. 30, 2009

The project dealt with the receivers intended for application in an ultra-wideband positioning system. The project covered a survey of receiver architectures and analysis of parameters essential for receiver operation in the localization system. A concept of the receiver has been proposed and discussed. Within the project, digital and analogue receiver modules were developed and investigated.

Obtained results have been published in several papers. Developed modules provide a basis for further investigations, focused on transmission and reception of ultra-wideband signals.

[Pro27] **Development of High-power High-efficiency Amplitude Modulators** (Doskonalenie wysoko-sprawnych modulatorów amplitudy o dużej mocy wyjściowej).
Juliusz Modzelewski, W. Kazubski, M. Mikoła-jewski, H. Chaciński;
Aug. 04, 2008 – Nov. 30 2009

The project concerns resonant power amplifiers applied to high-efficiency drain (or collector) amplitude modulators. Analyses of both h.f. output voltage amplitude and power efficiency vs. dc supply voltage were carried out for two MOSFET resonant power amplifiers: a) the Class E amplifier with the switch shunt capacitor composed of only non-linear transistor output capacitance, b) overdriven Class C amplifier. It has been shown that dc supply voltage variations mistune the Class E amplifier reducing its efficiency for the low supply voltages without, however, a significant linearity degradation of its static drain modulation characteristic. For the overdriven Class C amplifiers it has been proven that application of MOSFETs with high on-resistance comparing to the load resistance ($R_{DS(on)}$ /R_d=0.1) degrades, both the amplifier power efficiency and the linearity of its static drain modulation characteristic, but the drain-source voltage is approximately sinusoidal. In contrast, for the MOSFETs with low on-resistance ($R_{DS(on)}$ /R_d=0.01) these parameters of the Class C amplifier are better, but the drain-source voltage is distorted.

[Pro28] **Image Telediagnostic System** (System telediagnostyki obrazowej).
Artur Przelaskowski;
Aug. 04, 2008 – Nov. 30, 2009

The purpose of this research was integrated, teleinformation system for radiological workstation with extended functionality for computer-aided diagnosis (CAD). Interactive and intelligent tools were developed for stand-alone image interpretation and teleconsultations over intra- and inter-net. There are three major contributions that cover our work: improvement of the multiscale image analysis methods, with special emphasis placed on non-separable two-dimensional kernels of curvelets and contourlets;

- elaborating the preliminary tools for teleconsultation system, with implementation of RIS/PACS modules and reference image database;
- improvement of CAD schemes connected with validation and experimental verification: detection of early ischemic stroke, cancer detection in mammograms, pathology detection in bronchoscopy examinations; moreover, an improvement of coding procedures and content-based indexing methods for radiological applications was performed.

[Pro29] **Modern Radiocommunication Systems – Selected Problems** (Współczesne systemy radio-komunikacyjne – wybrane problemy).
Tomasz Kosiło, S. Hahn, T. Buczkowski, K. Czerwiński, J. Jarkowski, W. Kazubski, K. Snopek;
Aug. 04, 2008 – Nov. 30, 2009

This work covers the theoretical and practical problems of modern radiocommunication systems. The need for new data and multimedia services is growing position. Because of this it is necessary to develop new transmission algorithm, new methods of radio networks management, to solve problems of electromagnetic compatibility. In the frame of this contract we studied the following problems: new methods of signals and systems description, problems of radio networks development and problems of graph theory, study of mobile wireless systems properties and multimedia applications.

[Pro30] **Investigations in the Range of Networks and Data Explorations** (Badania w zakresie sieci i eksploracji danych).
Jacek Wojciechowski, Z. Walczak, A. Dominik, M. Czajko;
Aug. 04, 2008 – Nov. 30, 2009

The project aimed at techniques for searching large data bases with the use of graph patterns, the algorithm exploiting contrast graphs was proposed and tested on real data bases: classification of chemical compounds, web pages. Multicriteria optimization of trees with constraints. A heuristic algorithm solving the problem of finding optimal tree of a graph with constraints on vertex degree and path length has been proposed and tested. Application of the algorithm to designing of telecommunications network was shown. The published results are: 1 chapter in the Encyklopedia on Data Warehousing, 1 paper in the Polish journal, 3 papers at international conferences.

[Pro31] **Interpretation of Measurement Data - Methodology and Meta-metrological Aspects** (Interpretacja danych pomiarowych – metodyka i aspekty meta-metrologiczne).
Roman Z. Morawski, A. Miękina, A. Podgórski;
Aug. 04, 2008 – Nov. 30, 2009

The primary objective of the project is related to the methodology of 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 systematic study of the logical and methodological fundamentals of metrology, as well as a systematic approach of the design-and-implementation issues related to applications of digital signal processing in biochemical and electro-acoustic measurements. The results of the research accomplished were partially presented during an international conference and several local seminars.

[Pro32] **Audiovisual Network Hybrid Systems** (Audio-wizualne sieciowe systemy hybrydowe).
Krystian Ignasiak, W. Skarbek, G. Galiński, A. Buchowicz, G. Pastuszak, S. Badura, M. Leszczyński J. Naruniec, A. Nowakowski, M. Tomaszewski;
Aug. 04, 2008 – Nov. 30, 2009

The main aim of the project was to develop algorithms for intelligent multimedia interfaces. As the example of such interfaces, an intelligent cash machine has been chosen. The intelligence of the cash machine manifests in introducing new communications channels, improved, not only PIN based, authorization methods, and introducing some elements of surveillance system: audiovisual sequences from sensors can be annotated automatically and stored in the database for further processing or for evidence of unusual user behavior. Recent achievements include: development of multi-video and distributed video rate control techniques, optimizations of motion estimation algorithms, development of voice source localization algorithm in 3D space, development of camera calibration algorithm referring to optical distortion based on color and gray scale patterns, hardware development of 3D shape acquisition system by infrared structure light, and development of new image replica detector. During the project lifetime, the database of human faces in different lighting conditions was created and extended.

4.3.2 Projects granted by the Rector

[Pro33] **Creation of Monitor of Shape of the Beam for Application with Nuclear Accelerators** (Stworzenie monitora kształtu wiązki dla użytku z akceleratorami jądrowymi).
Ewa Piątkowska-Janko, P. Chmielewski, P. Kamiński, M. Pachocki, A. M. Laskowski, B. Radzik;
Apr. 16 – Dec. 31, 2009

The main goal of this project was to create a device which would be able to monitor shape of the beam from the particle accelerator. This aim was achieved by measuring resistance within copper wire webbing. Upon being hit by a beam of electrons the matrix changes its temperature (and resistance). By analyzing those changes it is possible to designate the matrix' temperature gradient and estimate quantity distribution of the beam.
- Beam's Shape Monitor consists of:
- measurement matrix (size from 16 rows and 16 columns to 64 rows and 64 columns of copper wires);
- analog measurement module - a part of the system placed next to accelerator, under influence of ion radiation field;
- controlling module - a microprocessor-based unit placed outside the accelerator bunker, connected with analog measurement module by several differential transmission lines. It transmits data to the PC through an USB interface;
- PC with software - acquires data and visualizes.

[Pro34] **Capsule Board Electronics System for the Stratospheric Balloon Missions** (System elektroniki pokładowej kapsuły dla stratosferycznych misji balonowych).
Krzysztof Kurek, M. Stolarski, A. Cichocki;
Apr. 16 – Dec. 31, 2009

The main aim of the project was to design an electronic platform for future balloon missions realized by Space Engineering Student Scientific Group. The platform consists of CW and FSK transceiver, microprocessor controller to data acquisition from payload, and additionally GPS module, allowing to find the capsule after its landing.

[Pro35] **Multi-plane Capacitance Tomograph for Flow Speed Measurement** (Wielopłaszczyznowy elektryczny procesowy tomograf pojemnościowy o wysokiej rozdzielczości pozycyjnej).
Roman Szabatin, W. Smolik, T. Olszewski, P. Machniewski, S. F. Filipowicz;
Apr. 17 - Mar. 31, 2009
University Research Program.

The main purpose of this University Research Program was the integration of research activities in the field of multi-plane capacitance tomograph carried out at three faculties of the University – The Faculty of Electrical Engineering, The Faculty of Chemical and Process Engineering, Faculty of Electronics and Information Technology (Institute of Radioelectronics, Division of Nuclear and Medical Electronics). The aim of the project is to elaborate, construct and verify a multi-plane capacitance tomograph for flow speed measurement, which will be working in real time.

[Pro36] **Microwave Synthesis form Mixture of Powders with the Different Absorption of Electromagnetic Waves** (Mikrofalowa synteza z mieszanin proszków o różnej zdolności do absorpcji fal elektromagetycznych).
Wojciech Gwarek, P. Kopyt
Apr. 16, 2009 - Mar. 31, 2010
University Research Program.

This project is carried out at three faculties of the University – The Faculty of Materials Science and Engineering, The Faculty of Power and Aeronautical Engineering, Faculty of Electronics and Information Technology (Institute of Radioelectronics, Division of Microwave and Radiolocation Engineering).

[Pro37] **Frequency-Spatial Methods for Detection of Face Fiducial Points** (Przestrzenno-częstotliwościowe metody detekcji punktów charakterystycznych twarzy).
Władysław Skarbek, J. Naruniec;
Ph.D grant
Jun. 29, 2009 – Oct. 31, 2010

The aim of the project is the development of an entry system based on the biometric information. Highest emphasis is put on the face analysis procedure, including face detection and recognition. The system is equipped with high-definition camera that delivers images of resolution and quality facilitating reliable analysis of facial features

[Pro38] **Imaging Disease Markers – Warsaw University of Technology Involvement in Bioimaging Research Cente**r (Markery obrazowe procesów chorobowych – udział Politechniki Warszawskiej w pracach Naukowego Centrum Obrazowania Biomedycznego).
Piotr Bogorodzki, H. Skarżyński, K. Kochanek, T. Wolak, E. Piątkowska-Janko, M. Kazubek, T. Jamrógiewicz, Ł. Kołaszewski, W. Obrębski, K. Kamińska, S. Adaszewski;
Jun. 04, 2009 - Mar. 31, 2010

The main aim of this project is to develop a MRI compatible audio system with the capabilities of measuring subject specific hearing levels, providing high level acoustic exposures. Proposed system will consist of piezoelectric Sound Delivery System (SDS), subject response pads, stimulation software called AudioStim. AudioStim will be extended version of our fMRI stimulating software with sound calibration procedures and two basic auditory tests: traditional tonal audiometry, Biomedical Informatics Research Network BIRN auditory tests.

4.4 Other projects

[Pro39] **New Neutron Detection Techniques in Industrial and Customs Applications** (Opracowanie i wykonanie układów elektronicznych do detektorów radiologicznych, projekt badawczy: Nowe techniki detekcji neutronów w zastosowaniach przemysłowych i kontroli granic).
Krzysztof Zaremba, M. Ziembicki, M. Dziewiecki, R. Kurjata, J. Marzec;
Mar. 17, 2008 – Mar. 31, 2009
Funded by Andrzej Soltan Institute for Nuclear Studies (Instytut Problemów Jądrowych im. Andrzeja Sołtana).

The aim of the project is to develop a detector for neutron radiography, capable of working at low intensity neutron flux. The detector works similarly to gamma camera and utilizes multi-channel photomultiplier tubes, modular data acquisition system and digital image reconstruction. Depending on the type of scintillator, thermal and fast neutron imaging is possible.

[Pro40] **Development of Video Content Management Technologies and Software** (Opracowanie i rozwój technologii i oprogramowania do zarządzania zawartością wideo).
Władysław Skarbek, K. Wnukowicz, G. Galiński, M. Jędryka;
Apr. 1, 2008 – Mar. 31, 2009
Funded by Mitsubishi Electric Information Technology Center Europe B.V.

The project was a continuation of the previous work on development of Advanced Video Player application and library of functions for video content processing and management. There were two main work-packages. The first work-package of this project concentrates on the further development of an Advanced Video Player which allows for fast shot, scene and chapter navigation and video browsing using pre-computed audiovisual meta-data. The second work-package of the project concentrates on the development of technologies and software for video recommendation using pre-computed structural and audiovisual meta-data. The additional objective of the project

was the maintenance of the developed software modules and improvements according to user feedback.

[Pro41] **Development of Video Description, Matching and Recommendation Technologies and Software** (Opracowanie i rozwój technologii i oprogramowania do opisu, wyszukiwania i rekomendacji wideo).
Władysław Skarbek, K. Wnukowicz, G. Galiński, M. Jędryka;
Jan. 1, 2009 – Mar. 31, 2009
Funded by Mitsubishi Electric R&D Centre Europe, UK.

The aim of the project was the development of video description, matching and recommendation technologies and software. The project consisted of 3 work packages. The objective of the first work package was the development of video segment description and matching technologies and software for the detection of repeated scenes around commercials. The objective of work package 2 was the development of video programme description and recommendation technologies and software. The objective of work package 3 was to provide support in the development of MPEG-7 Video Signature technology.

[Pro42] **Analysis of Possible Mutual Influence of Air--traffic Control Radars of the Poznań Airport** (Analiza wzajemnego wpływu pracy radarów dozorowania ruchu lotniczego portu lotniczego w Poznaniu).
Wojciech Wojtasiak, D. Gryglewski;
May 31, 2009 – Jun. 10, 2009
Funded by Polish Air Navigation Services Agency (Polska Agencja Żeglugi Powietrznej).

The aim of the analysis was to choose the optimum placement of newly installed radar and to predict its possible interference with existing air-traffic control and meteorological radars.

[Pro43] **Prediction of the Influence of the Planned Passenger Airport Terminal in Wrocław on the Radars Operated by Polish Air Navigation Services Agency** (Przewidywalny wpływ planowanego terminala pasażerskiego we Wrocławiu na wskazania radarów będących w zarządzaniu Polskiej Agencji Żeglugi Powietrznej).
Wojciech Wojtasiak, D. Gryglewski;
May 15, 2009 – Jun. 22, 2009
Funded by Wroclaw Airport Ltd. (Port Lotniczy Wrocław, Spółka Akcyjna).

The aim of the project was to predict the influence of the planned building of the passengers terminal on the existing air-traffic control facilities.

[Pro44] **Analysis of the Planned Construction of the Air Traffic Control Center on the Operation of the Secondary Surveillance Radar (MSSR) in the Airport of Rzeszów** (Analiza wpływu budowy Ośrodka Kontroli Ruchu Lotniczego Rzeszów na wskazania radaru wtórnego MSSR w Porcie Lotniczym Rzeszów).
Wojciech Wojtasiak, D. Gryglewski;
Nov. 30, 2009 – Feb. 27, 2010
Funded by Polish Air Navigation Services Agency (Polska Agencja Żeglugi Powietrznej).

The main goal of the project is the prediction of the influence of the planned building (and its technical environment) of the Air Traffic Control Center in Rzeszów on the currently operating radar facilities.

[Pro45] **Construction of a Computer-Controlled System of Several Microwave Power Generators (part 2 of the project)** (Budowa sterowanego komputerowo systemu kilku mikrofalowych generatorów mocy, część 2 projektu).
Wojciech Gwarek, W. Wojtasiak, D. Gryglewski, P Przybyszewska, P. Korpas, M. Lubiejewski;
Feb.1, 2009 – April. 30, 2009
Funded by industrial partner from Sweden

Revealing of the details of the work is restricted by the contract with the funding institution.

[Pro46] **Computer Calibration of KST – AP 2/3** (Kalibracja komputerowa stanowiska KST – AP 2/3).
Krzysztof Robaczyński;
Jul. 13, 2009 – Sept. 7, 2009
Funded by Military Institute of Armament Technology (Wojskowy Instytut Techniczny Uzbrojenia)

The main goal of this project was to elaborate functional investigations and the analysis of results concerning specialized military unit.

[Pro47] **Analysis of the Innovation Level of the Project "Destruction of Tomours Using a Robot"** (Analiza innowacyjności w postaci przygotowanego dokumentu opinii o innowacyjności projektu "Niszczenie guzów nowotworowych przy użyciu robota").
Krzysztof Zaremba;
Oct. 10, 2009 -Oct. 22, 2009
Funded by Institute of Cybernetic Surgery (Instytut Chirurgii Cybernetycznej).

The opinion for Polish Agency for Enterprise Development prepared in the frames of the project is strictly confidential.

[Pro48] **Consulting of Feasibility of the LCD Panel for the Tram Internal Information Display** (Przygotowanie opinii o wyświetlaczu LCD wewnętrznej tablicy informacyjnej tramwaju).
Władysław Skarbek, A. Buchowicz;
Oct. 28, 2009 – 02.11.2009
Funded by Tramwaje Warszawskie, sp. z. o.o.

The main goal of the work was to perform analysis of the LCD panel feasibility for the internal information display to be used in the Warsaw public transport system.

[Pro49] **Analysis of Noise Emitted by Helicopters During their Starts and Landing on the Landing Fidel of the National Security Bureau** (Analiza hałasu powodowanego przez starty i lądowania śmigłowców na lądowisku Biura Bezpieczeństwa Narodowego).
Zbigniew Kulka;
Dec. 17, 2009 – Dec. 19, 2009
Funded by Administrative Office of the Chancellery of the President of the Republic of Poland (Biuro Administracyjne Kancelarii Prezydenta RP)

Revealing of the details of the work is restricted by the contract with the funding institution.

[Pro50] **The Design and Manufacturing of Three Pieces of Antenna Splitter at 5.8 GHz** (Projekt oraz wykonanie trzech egzemplarzy rozdzielacza antenowego 5,8 GHz).
Yevhen Yashchyshyn, P. Bajurko;
Sept. 21, 2009 – Oct. 30, 2009
Funded by CAMSAT Gralak Przemysław

The designed splitter consists of ceramic filter with the center frequency 5.8 GHz and bandwidth 150 MHz, integrated low noise power amplifier and the set of three Wilkinson power divider in order to divide the input signal into four outputs. The microwave circuit is realized on the low cost microwave laminate.

4.5 Other activities

4.5.1 Reviews of the EU Projects

Reviews of Projects within the Frame of the EU Structural Funds (Recenzje projektów europejskich).
Piotr Bogorodzki, Małgorzata Celuch, **Jacek Wojciechowski**

4.5.2 Partnership

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

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 – namely from the Division of Nuclear and Medical Electronics.

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 participate in different international and internal educational space projects. Main of them are:

project of ESEO (European Student Earth Orbiter) micro-satellite supported by European Space Agency ESA and realized by students from European Universities. Students from Warsaw University of Technology (WUT) are responsible for realization of on-board data handling OBDH subsystem, mechanical configuration of the satellite and operation of the satellite after launch;

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

Biomedical and Nuclear Engineering Student Scientific Group
Ewa Piątkowska-Janko – tutor.

Biomedical and Nuclear Engineering Student Scientific Group was formed in Dec. 2005 by a group of students from Biomedical Engineering. It has eight members. In May and June 2006 they organized workshop on the basic features of construction and AutoCad. Current activity is focused on building the mobile ECG equipment.

Innovative Information Technologies Student Scientific Group
Przemysław Miazga – tutor.

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

Technique in Medicine Student Scientific Group
Artur Przelaskowski – tutor.

Technique in Medicine Student Scientific Group – SKNTechMed (in Polish Studenckie Koło Naukowe Techniki w Medycynie) was formed in December 2008. The aim of this scientific group is to unite two different spheres: technique and medicine, that cannot perform duties separately. Though it is the first year, the members of SKNTechMed have a lot of ideas for the start:

- series of open lectures for students led by interesting people from the world of science;
- promotion of Biomedical Engineering among students;
- trips for students to places related with biomedical engineering;
- partnership with the Student Scientific Groups from the Medical University of Warsaw.

5 TITLES AND DEGREES AWARDED

5.1 Ph.D. Degrees

[PhD1] Ali Alwafie Fathi: *"Ray tracing model for estimating radio wave propagation characteristics inside building"*, Prof. **J. Modelski** (supervisor), Warsaw, May 12, 2009.

[PhD2] Marek Bury: *"Obrazowanie obiektów na podstawie wielopunktowej akwizycji mikrofalowych sygnałów szerokopasmowych"* (Objects Imaging Using Multipoint Acquisition of Broadband Microwave Signals), Prof. **J. Modelski** (supervi-sor), Warsaw, Dec. 8, 2009.

[PhD3] Andrzej Dominik: *"Klasyfikacja grafów z wykorzystaniem kontrastowych wzorców strukturalnych"* (Graph Classification Using Structural Contrast Patterns), Prof. **J. Wojciechowski** (supervisor), Warsaw, Nov. 3, 2009.

[PhD4] Mateusz Orzechowski: *"Badania nad ilościową oceną perfuzji tkanki mózgowej z wykorzystaniem dynamicznych badań tomograficznych"*, (Investigations on Quantitive Estimation of Brain Tissue Perfusion Using Dynamic Tomographic Tests) Prof. **K. Zaremba** (supervisor), Warsaw, Jan. 6, 2009.

[PhD5] Robert Sulej: *"Sztuczne sieci neuronowe w zadaniach klasyfikacji w eksperymentach fizyki wysokich energii"*, (Applications of the Neural Networks in Classification Tasks in the High Energy Physics Experiments) Prof. **K. Zaremba** (supervisor), Warsaw, Jan. 13, 2009.

[PhD6] Artur Trybuła: *"Zastosowanie optycznej tomografii dyfuzyjnej w badaniach funkcjonalnych narządów"* (Application of Fiber Diffusion Tomograph in Functional Investigations of Human Parts), Prof. **J. Marzec** (supervisor), Warsaw, Nov. 17, 2009.

5.2 M.Sc. Degrees

[MSc1] Andrzej Abramowski: *"Implementacja sprzętowa dekodera arytmetycznego standardu kodowania wideo H.264/AVC"* (Context-adaptive binary arithmetic decoder hardware module for H.264/AVC), Assist. Prof. **G. Pastuszak** (supervisor), (5).

[MSc2] Stanisław Adaszewski: *"Badanie stabilności skanera MR podczas dynamicznego skanowania czynnościowego (fMRI)"* (Measurement of MR scanner stability during functional magnetic resonance imaging (fMRI) studies), Assist. Prof. **P. Bogorodzki** (supervisor), (5).

[MSc3] Marcin Augustyniak: *"Bezprzewodowe sieci lokalne standardu draft IEEE 802.11n"* (Draft IEEE 802.11n wireless local area networks), Docent **T. Kosiło**, (supervisor), (5).

[MSc4] Dariusz Baciński: *"Transkodowanie sekwencji wizyjnych"* (Digital video transcoding), Assist. Prof. **A. Buchowicz** (supervisor), (5).

[MSc5] Katarzyna Basaj: *"Falowodowe modelowanie dźwięku na przykładzie gitary klasycznej"* (Waveguide modeling of classical guitar), Assist. Prof. **P. Bobiński** (supervisor), (4).

[MSc6] Jarosław Beksa: *"Opracowanie metodyki obrazowania MRI z zastosowaniem tlenu jako środka kontrastowego"* (NMR pulmonary imaging using oxygen as a contrast agent), Assist. Prof. **E. Piątkowska-Janko** (supervisor), (5).

[MSc7] Jan Bełczewski: *"Wzmacniacz nadawczy o mocy 100 W z tranzystorami SiC MESFET do systemów WLL"* (Design and practical realization of 100 W transmitting amplifier with SiC MESFET transistors for wireless local loop systems), Assist. Prof. **D. Gryglewski** (supervisor), (5).

[MSc8] Tyberiusz Berlicki: *"Bezprzewodowy analizator stanu magistrali USB"* (Wireless USB bus analyzer), Senior Lecturer **T. Jamrógiewicz** (supervisor), (5).

[MSc9] Bartosz Bielawski: *"Synchroniczny konwerter częstotliwości próbkowania"* (Synchronous sample rate converter), Assist. Prof. **P. Bobiński** (supervisor), (5).

[MSc10] Grzegorz Błoński: *"Układ automatycznej regulacji wzmocnienia do odbiornika ultraszerokopasmowego systemu lokalizacyjnego"* (The automatic gain control circuit in ultrawideband receiver used as a part of location system), Assist. Prof. **J. Kołakowski** (supervisor), (5).

[MSc11] Mariusz Bojarski: *"System do hiperpolaryzacji gazów szlachetnych metodą SEOP z wykorzystaniem lasera półprzewodnikowego"* (System for hyperpolarization of noble gases with spin exchange optical pumping using LDA), Assist. Prof. **E. Piątkowska – Janko** (supervisor), (5).

[MSc12] Paweł Borkowski: *"Realizacja algorytmów synchronizacji odbioru sygnału DRM w środowisku SIMULINK"* (Implementation of synchronization algorithms at DRM signal reception in SIMULINK environment), Senior Lecturer **H. Chaciński** (supervisor), (5).

[MSc13] Jarosław Brodzisz: *"Układ bezpiecznego włączenia rezonansowego wzmacniacza mocy klasy D z tranzystorami komplementarnymi"* (Fail-safe switch-on circuit for resonant class-D power amplifier with complementary transistors), Assist. Prof. **J. Modzelewski** (supervisor), (5).

[MSc14] Maciej Brylski: *"Symulator do testowania rozdzielczości czasowej gammakamery"* (Hardware gamma camera simulator for dead-time testing), Docent **P. Brzeski**, (supervisor), (5).

[MSc15] Grzegorz Brzuchalski: *"Sprzętowa implementacja modułu transformacji kodeka audio standardu MPEG-4 AAC"* (Hardware implementation of the audio codec transformation module of the MPEG-4 AAC standard), Assist. Prof. **G. Pastuszak** (supervisor), (5).

[MSc16] Joanna Monika Czapska: *"Zagadnienie estymacji kierunków źródeł sygnałów przy wykorzystaniu szyku czujników"* (Direction-of-arrival estimation with sensor arrays), Prof. **Y. Yashchyshyn** (supervisor), (5).

[MSc17] Tomasz Danielewski: *"Środowisko programowe do analizy wyników pomiaru z miernika SVAN 945 A"* (The software dedicated to post-processing of data read from SVAN 945 A meter), Assist. Prof. **A. Podgórski** (supervisor), (5).

[MSc18] Marcin Andrzej Dębiński: *"Analiza, projekt i realizacja wybranych układów wzmacniaczy sygnałów EKG z bezprzewodową akwizycją danych"* (Analysis, project and realization of selected EGG signal amplifiers with wireless data acquisition), Assist. Prof. **G. Domański** (supervisor), (5).

[MSc19] Julia Domżalska: *"Standard xforms – analiza możliwości wykorzystania w nowoczesnych architekturach programowo-sprzętowych"* (The xforms standard – analysis of possibilities of use of the xforms standard in modern software and hardware architectures), Assist. Prof. **A. Więckowski** (supervisor), (4.5).

[MSc20] Ziemowit Jagodziński: *"Opracowanie akustyczne pomieszczenia do odsłuchu dźwięku przestrzennego w telewizyjnym wozie transmisyjnym HDTV"* (Acoustic room's preparation for audio monitoring in HDTV transmission vehicle), Prof. **Z. Kulka** (supervisor), (5).

[MSc21] Paweł Jamioła: *"Quality of IP transmission in mobile networks"* (Jakość transmisji IP w sieciach telefonii komórkowej), Assist. Prof. **T. Keller** (supervisor), (4.5).

[MSc22] Kamil Janeczek: *"System inwentaryzacji urządzeń z wykorzystaniem identyfikacji radiowej RFID"* (System of device stocktaking with application of Radio Frequency Identification RFID), Assist. Prof. **K. Czerwiński** (supervisor), (5).

[MSc23] Maciej Jaworski: *"Wybrane elementy szpitalnego systemu informacyjnego z obsługą badań obrazowych"* (Selected elements of a hospital information system with a medical image results support), Prof. **A. Przelaskowski** (supervisor), (5).

[MSc24] Justyna Jędrzejewska: *"Analiza zmian wymiaru fraktalnego w zależności od parametrów rekonstrukcji fantomów Hoffmana i Jaszczaka w tomografii SPECT"* (Analysis of changes in fractal dimension based on reconstruction parameters of Hoffman's and Jaszczak phantoms in SPECT tomography), Docent **P. Brzeski**, (supervisor), (4.5).

[MSc25] Karolina Kamińska: *"Fantom do pomiaru stabilności krótko- i długoczasowej skanera MR w czasie eksperymentu fMRI"* (A phantom for temporal stability measurements of MR scanner during fMRI experiments), Assist. Prof. **E. Piątkowska-Janko** (supervisor), (5).

[MSc26] Narcyz Kielar: *"Próbkujący przetwornik analogowo-cyfrowy"* (Sampling analog to digital converter), Prof. **J. Marzec** (supervisor), (5).

[MSc27] Łukasz Kołaszewski: *"Detektor do celów podwójnego rezonansu protonowo-elektronowego (PEDRI)"* (Detector for proton-electron double resonance imaging (PEDRI)", Assist. Prof. **P. Bogorodzki** (supervisor), (5).

[MSc28] Marcin Konczak: *"Wirtualny analizator widma w paśmie ISM 2,4 GHz"* (The 2.4 GHz ISM band virtual spectrum analyzer), Assist. Prof. **R. Łukaszewski** (supervisor), (5).

[MSc29] Piotr Konczak: *"Optymalizacja algorytmu FDTD przy wykorzystaniu nowoczesnych układów graficznych zgodnych z architekturą CVDA"* (Optimizing the FDTD algorithm using innovative graphies boards compatible with the CVDA architecture), Assist. Prof. **M. Sypniewski** (supervisor), (5).

[MSc30] Adam Kopeć: *"Segmentyzacja struktur mózgu z wykorzystaniem badań tomografii komputerowej"* (Segmentation of brain structures using CT images), Prof. **A. Przelaskowski** (supervisor), (5).

[MSc31] Anna Ksyta: *"Mobilne systemy lokalizacyjne z wykorzystaniem technologii bezprzewodowych"* (Mobile location systems based on wireless technologies), Assist. Prof. **T. Keller** (supervisor), (5).

[MSc32] Marcin Leskier: *"Symulacja propagacji sygnału elektrycznego w dwuwymiarowej strukturze modelującej komórki serca z użyciem modelu FitzHugh-Nagumo"* (Simulation of electrical impulse propagation in two-dimensional structure modelling heart cells using the FitzHugh-Nagumo model), Assist. Prof. **B. Konarzewski** (supervisor), (5).

[MSc33] Krystian Lipka: *"Model systemu radiologii cyfrowej do zastosowań inspekcyjnych"* (Model of digital radiography system for inspection applications), Assist. Prof. **B. Konarzewski** (supervisor), (5).

[MSc34] Maciej Markowski: *"Wprowadzenie "e-usług" w administracji w Polsce"* (Introducing "e-goverment" in Poland), Prof. **J. Wojciechowski** (supervisor), (4).

[MSc35] Paweł Nawrocki: *"System rozpoznawania twarzy"* (Face recognition system), Prof. **Skarbek** (supervisor), (5).

[MSc36] Zbigniew Nasarzewski: *"Tomografia neutronowa – rekonstrukcja trójwymiarowa na podstawie obrazów neutronograficznych"* (Neutron Tomography – 3D reconstruction based on neutronography images), Prof. **K. Zaremba** (supervisor), (4.5).

[MSc37] Olimpia Pawlik: *"Analityczna predykcja pokrycia I pojemności sieci w systemach UMTS"* (Analytical prediction of coverage and capacity in UMTS system), Assist. Prof. **T. Keller** (supervisor), (5).

[MSc38] Michał Płocharski: *"Analiza metod wielopa-smowej transmisji danych w systemie Docsis 3.0"* (Analysis of the multiband data transmission methods methods in Docsis 3.0 systems), Assist. Prof. **T. Keller** (supervisor), (5).

[MSc39] Radosław Poświata: *"Wykorzystanie węzłów przekaźnikowych w bezprzewodowych sieciach radiowych"* (Relay nodes in wireless sensor networks), Assist. Prof. **Z. Walczak** (supervisor), (4.5).

[MSc40] Paweł Pruszyński: *"Analiza układów do odbioru sygnału w radiograficznych detektorach lumi-nescyjnych"* (The analysis of circuits used in receiving signals from luminescent radiographic detectors), Assist. Prof. **B. Konarzewski** (supervisor), (5).

[MSc41] Paulina Przybyszewska: *"Wzmacniacz nadawczy dla systemu WiMAX w technologii GaN"* (Power amplifier in GaN technology for Wimax system base station), Assist. Prof. **W. Wojtasiak** (supervisor), (5).

[MSc42] Aleksandra Rachocka: *"Zastosowanie mieszaczy Gaussów jako modelu obrazu do segmentacji istotnych obszarów mózgu w TK"* (Gaussian mixture modeling for brain structure segmentation of examinations), Prof. **A. Przelaskowski** supervisor), (5).

[MSc43] Bartłomiej Radzik: *"Elektryczny tomograf pojemnościowy ECT Irena"* (Electrical capacitance tomograph Irena), Docent **R. Szabatin**, (supervisor), (5).

[MSc44] Mikołaj Roszkowski: *"Sprzętowa implementacja układu predykcji intra i rekonstrukcji dla kodeka standardu H.264/AVC"* (Intra prediction and reconstruction hardware modules for H.264/AVC codec), Assist. Prof. **G. Pastuszak** (supervisor), (5).

[MSc45] Tomasz Rykowski: *"Eksperymentalna weryfikacja modelu akustycznego sali balowej Zamku Królewskiego z zastosowaniem auralizacji"* (Experimental verification of the acoustic model of the Warsaw Royal Castle's ball room with auralization application), Assist. Prof. **M. Tajchert** (supervisor), (5).

[MSc46] Barbara Sas: *"Sprzętowa impelementacja transformacji falkowej kodera standardu JPEG 2000"* (Hardware implementation of discreate wavelet transform of the JPEG 2000 standard), Assist. Prof. **G. Pastuszak** (supervisor), (5).

[MSc47] Piotr Schmidt: *"Aspekty planowania sieci radiowej systemu UMTS. Weryfikacje modelu propagacyjnego"* (UMTS radio network planning aspects. Verification of radio propagation model), Docent **T. Kosiło**, (supervisor), (4.5).

[MSc48] Łukasz Sienica: *"Kalibracja modelu propagacyjnego w paśmie 870 MHz dla obszaru miejskiego"* (870 MHz propagation model calibration for urban areas), Docent **T. Kosiło,** (supervisor), (5).

[MSc49] Mateusz Skóra: *"Źródło sygnałów ultraszerokopasmowych w paśmie 6-8,5 GHz"* (The generator of ultra-wideband pulses working in a frequency band from 6 GHz to 8.5 GHz), Assist. Prof. **J. Kołakowski** (supervisor), (5).

[MSc50] Grzegorz Skwarski: *"Bezpieczny mobilny system monitoringu wizyjnego pomieszczeń w technologii JAVA"* (Realization of secure mobile video monitoring system over the time JAVA platform), Assist. Prof. **R. Łukaszewski** (supervisor), (5).

[MSc51] Piotr Służewski: *"Projekt i realizacja oraz badanie kołowego szyku antenowego z przełączaniem elementów"* (Project, realization and investigation of circular antenna array with switching elements), Prof. **Y. Yashchyshyn** (supervisor), (4.5).

[MSc52] Tomasz Sobczuk: *"Realizacja funkcji przenoszenia sygnału akustycznego przez warstwę powietrza"* (Transfer function implementation of acoustic signal via layer of air), Assist. Prof. **P. Bobiński** (supervisor), (5).

[MSc53] Ireneusz Sobipan: *"Model układu pozycjono-wania listków w kolimatorze wielolistkowym"* (Model of multileaf collimator leafs positioning system), Prof. **K. Zaremba** (supervisor), (4).

[MSc54] Jakub Studziński: *"Detekcja ujęć w sekwencjach video"* (Shot detection in video sequences), Assist. Prof. **G. Galiński** (supervisor), (3.5).

[MSc55] Piotr Świeżewski: *"Emisja sygnału DRM z Radiowego Centrum Nadawczego w Solcu Kujawskim"* (Transmitting digital radio mondiale from Broadcast Center in Solec Kujawski), Assist. Prof. **J. Jarkowski** (supervisor), (4.5).

[MSc56] Piotr Szczepaniuk: *"Analiza metod kompresji danych w przypadku EPG – usługi telewizji cyfrowej"* (Algorithms of data compression in EPG – service of digital television), Assist. Prof. **K. Ignasiak** (supervisor), (5).

[MSc57] Piotr Tracz: *"Rozproszony system pomiarowo-sterujący do pomiaru parametrów transmisyjnych systemów wykorzystujących sieci komórkowe"* (Distributed measure – controlling system to measure transmission parameters of systems using cellular networks), Assist. Prof. **R. Łukaszewski** (supervisor), (4).

[MSc58] Jacek Wach: *"Comparison distributed video coding with hybrid video coding"*, Assist. Prof. **A. Buchowicz** (supervisor), (4).

[MSc59] Michał Wieczorek: *"Sprzętowa implementacja dekodera nagłówków i dekodera cavlc w standardzie kompresji wideo H.264/AVC"* (Stream header decoder and context: adaptive variable, length decoder, hardware module for H.264/AVC codec), Assist. Prof. **G. Pastuszak** (supervisor), (5).

[MSc60] Łukasz Włodarczyk: *"Odbiór sygnałów bioelektrycznych w przestrzeni tomografu MRI"* (The acquisition of the bioelectrical signals inside the

bore of a MRI scanner), Assist. Prof. **E. Piątkowska-Janko** (supervisor), (5).

[MSc61] Rafał Wojda: *"Wysokosprawny modulator AM o dużej mocy wyjściowej"* (High-efficiency high-power AM modulator), Assist. Prof. **J. Modzelewski** (supervisor), (4.5).

[MSc62] Piotr Wojtkiewicz: *"Symulacja komputerowa układu przetwarzania sygnałów wyjściowych klasycznej lampy cezowej w atomowym wzorcu częstotliwości"* (Computer simulation of circuit processing output signals from conventional cesium beam tube in atomic frequency standard), Assist. Prof. **K. Radecki** (supervisor), (5).

[MSc63] Tomasz Wójcik: *"System pomiarowo-kontrolny z wbudowanym stosem TCP/IP"* (Distributed measuring and control system based on embedded TCP/IP STACK), Assist Prof. **R. Łukaszewski** (supervisor), (4.5).

[MSc64] Grzegorz Wrzosek: *"Internetowa aplikacja bazodanowa – porównanie technologii"* (The Internet database application – a comparison of technologies), Assist. Prof. **T. Keller** (supervi-sor), (4.5).

[MSc65] Sebastian Zadora: *"Metody ewolucyjne w sztucznych sieciach neuronowych"* (Evolutionary methods in artifical neural networks), Prof. **K. Zaremba** (supervisor), (4.5).

[MSc66] Maciej Ziętek: *"Algorytmy kontroli topologii sieci w bezprzewodowych sieciach ad-hoc i sieciach sensorowych – porównanie"* (Toplogy control algorithms in wireless ad-hoc networks and sensor networks – comparison), Assist. Prof. **Z. Walczak** (supervisor), (5).

[MSc67] Łukasz Żukowski: *"Korelacyjna metoda terminali bezprzewodowych w środowisku wielodrogowej propagacji fal radiowych"* (Data base correlation method for radio mobile terminals positioning in multipath environment), Assist. Prof. **T. Keller** (supervisor), (5).

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

[MSc68] Jarosław Czapski: "Mikroprocesorowy generator sygnałów programowany za pomocą komputera" (Microprocessor signals generator programmed by computer), Assist. Prof. **K. Derzakowski** (supervisor), (5).

[MSc69] Łukasz John: "*Analiza zagrożeń dla urządzeń elektronicznych ze strony impulsowych zaburzeń elektromagnetycznych o małej energii*" (Analysis of threats electromagnetical impulse low-energy disturbances in electrical appliances), Assist Prof. **M. Laskowski** (supervisor), (4).

[MSc70] Tomasz Lubiejewski: *"Odbiornik pomiarowy dla systemu DRM"* (Measuring receiver for DRM radio system), Assist. Prof. **W. Kazubski** (supervisor), (5).

[MSc71] Anna Ługowska: *"Modernizacja sieci transportowej operatora w perspektywie nowych rozwiązań technicznych – analiza i projekt"* (Modernization of existing SDH network on the basis of the new technical solutions – analysis and the project), Docent **S. Kula**, (supervisor), (5).

[MSc72] Andrzej Przybysz: "*Ochrona urządzeń elektro-nicznych w inteligentnym domu przed zaburzeniami elektromagnetycznymi*" (Electronic appliances protection in an intelligent building against electromagnetic interference), Assist. Prof. **M. Laskowski** (supervisor), (4).

[MSc73] Paweł Stefaniak: *"Aplikacja wspomagająca optymalizację sieci CDMA 2000"* (CDMA network optimization tool), Assist. Prof. **R. Łukaszewski** (supervisor), (5).

[MSc74] Łukasz Szamota: *DCF77-pomiar poziomu sygnału oraz jakości odbioru"* (DCF77 – signal level and reception reliability survey), Assist. Prof. **W. Kazubski** (supervisor), (5).

[MSc75] Michał Wiśniewski: *"Zabezpieczenia we współczesnych sieciach bezprzewodowych IEEE 802.11"* (Security of modern wireless networks in IEEE 802.11 standard), Assist. Prof. **R. Kossowski** (supervisor), (5).

5.4 B.Sc. Degrees

[BSc1] Tomasz Adamczyk-Koreywo: *"Realizacja jednostki centralnej systemu Car-audio"* (Development of a head unit for a car-audio zet), Assist. Prof. **P. Bobiński** (supervisor), (5).

[BSc2] Igor Adamiak: "Akustyka nagrań muzycznych" (Acoustics of music recording), Assist. Prof. **M. Tajchert** (supervisor), (4), Warsaw University of Technology Distant Learning Center (Ośrodek Kształcenia na Odległość PW).

[BSc3] Krzysztof Bender: *"Multithread application for image replace recognition"*, Assist. Prof. **G. Galiński** (supervisor), (4.5), studies in English.

[BSc4] Marcin Bondyra: *"Konfiguracja elektrycznego tomografu pojemnościowego ET3"* (ET3 electrical capacitance tomograph configuration), Assist. Prof. **W. Smolik** (supervisor), (4).

[BSc5] Piotr Borkowski: *"Analiza wpływu algorytmów miksowania w dół na przestrzenność i jakość dźwięku"* (The analysis of influence of down-mix algorithms of spatiality and quality of sound), Assist. Prof. **M. Tajchert** (supervisor), (5).

[BSc6] Paweł Chmielewski: *"Rękawica fMRI – system pomiarowy przyśpieszeń do motorycznych badań czynnościowych mózgu"* (fMRI glove – acceleration measurement system for functional brain imaging), Assist. Prof. **E. Piątkowska-Janko** (supervisor), (5).

[BSc7] Hubert Chrzaniuk: *"Bezprzewodowy koncentrator USB"* (), Senior Lecturer **T. Jamrógiewicz** (supervisor), (5).

[BSc8] Adam Czapski: *"Rezonansowy wzmacniacz mocy klasy G"* (Class G tuned power amplifier), Assist. Prof. **J. Modzelewski** (supervisor), (5).

[BSc9] Łukasz Dańko: *"Zastosowanie przetworników CDC w elektrycznej tomografii pojemnościowej"* (Application of capacitance-to-digital converters in electrical capacitance tomography), Docent **R. Szabatin**, (supervisor), (5).

[BSc10] Piotr Demidowicz: *"Urządzenie do badania fotodiod krzemowych"* (Photodiode evaluation system), Assist. Prof. **G.Domański** (supervisor), (5).

[BSc11] Rityi Zakariya Dimka: *"Simulations of the compatibility between short range wireless communication system (Bluetooth and Wi-Fi)"*, Assist. Prof. **T. Keller** (supervisor), (5), studies in English.

[BSc12] Krzysztof Dobrowolski: *"Implementacja algorytmu rozpoznawania mowy w układach programowalnych FPGA"* (Hardware implementation of speech recognition algorithm on programmable FPGA), Assist. Prof. **P. Domaszewicz** (supervisor), (4.5).

[BSc13] Maciej Fijołek: *"Wykorzystanie interfejsu Bluetooth do zdalnego sterowania urządzeniem"* (Usage of Bluetooth interface for remote control), Assist. Prof. **K. Ignasiak** (supervisor), (4).

[BSc14] Paweł Grudziński: *"Design and implementation of engineering model of switch-model power supply system for Leonidas experiment in PW-Sat picosatellite"* (Projekt i wykonanie modelu inżynierskiego zasilacza impulsowego dla eksperymentu Leonidas na pikosatelicie PW-Sat), Assist. Prof. **K. Kurek** (supervisor), (4).

[BSc15] Piotr Gruziel: *"Prezentacja struktur i przekrojów elementów mikrofalowych w standardzie Open-GI"* (Presentation of the microwave elements structures and sections in the OpenGI standard), Assist. Prof. **A. Więckowski** (supervisor), (4).

[BSc16] Władysław Grzegorzewski: *"System for image replica detection"*, Assist. Prof. **G. Galiński** (supervisor), (4), studies in English.

[BSc17] Grzegorz Grzymała: *"Wykonanie stanowiska do programowania i odczytywania kart inteligentnych z dualnym interfejsem i biernym zasilaniem"* (Project and impelentation of a smart card reading/writing device), Prof. **J. Wojciechowski** (supervisor), (4.5).

[BSc18] Mirosław Jagiełło: *"Opracowanie wirtualnego miernika poziomu dźwięku w środowisku programowym Matlab"* (Implementation sound level meter in Matlab language), Assoc. Prof. **J. Żera** (supervisor), (5).

[BSc19] Rafał Jaworski: *"Opracowanie i badanie ultra-szerokopasmowej anteny Vivaldi"* (Study and research of ultrawideband Vivaldi antenna), Prof. **Y. Yashchyshyn** (supervisor), (4.5).

[BSc20] Kamil Jeziorski: *"Speech-driven face animation: video processing"*, Prof. **K. Zaremba** (supervisor), (5).

[BSc21] Janusz Kac: *"Terminal do odbiornika GPS"* (Display of GPS signal information), Assist. Prof. **K. Czerwiński** (supervisor), (4).

[BSc22] Przemysław Kamiński: *"Przetwornik analogowo-cyfrowy sygnałów ładunkowych"* (Analog to digital converter of charge signals), Prof. **J. Marzec** (supervisor), (5).

[BSc23] Paweł Kanarek: *"Generator DDS do skanera częstotliwości"* (Direct Digital Synthesis generator for frequency scanner), Senior Lecturer **H. Chaciński** (supervisor), (4.5).

[BSc24] Agata Korpysz: *"Metody poprawy jakości archiwalnych zdjęć i dokumentów"* (Ways of improving the quality of archival pictures and documents), Prof. **A. Przelaskowski** (supervisor), (5), Warsaw University of Technology Distant Learning Center (Ośrodek Kształcenia na Odległość PW).

[BSc25] Tomasz Krochmal: *"Wzmacniacz niskoszumowy na pasmo X (9,4-9,5 GHz)"* (X-band low noise amplifier (9.4-9.5 GHz), Assist. Prof. **D. Gryglewski** (supervisor), (5).

[BSc26] Przemysław Kryjan: *"Odbiornik systemu radiowego do sterowania urządzeniami elektrycznymi"* (Radio receiver controlling electric appliances), Assist. Prof. **K. Czerwiński** (supervisor), (5).

[BSc27] Marcin Krzewski: *"Bezprzewodowe urządzenie fMRI do monitorowania ruchów palców"* (A wireless fMRI device for fingers motion monitoring), Assist. Prof. **P. Bogorodzki** (supervisor), (5).

[BSc28] Tomasz Adam Kucharski: *"Hardware implementation of the AAC quantization"*, Assist. Prof. **G. Pastuszak** (supervisor), (4), studies in English.

[BSc29] Mateusz Kurdej: *"Speech transmission index implementation using MATLAB"* Asoc. Prof. **J. Żera** (supervisor), (5), studies in English.

[BSc30] Artur Marcin Laskowski: *"Urządzenie do wspomagania poruszania się osób niewidomych – elektroniczny kompas"* (A device for supporting the movement of blind persons – an electronic compass), Assist. Prof. **G. Domański** (supervisor), (5).

[BSc31] Katarzyna Laszczka: *"Program kliniczny do diagnostyki tarczycy na podstawie badań scyntygraficznych"* (Clinical program for thyroid diagnosis on the base of scintigraphic images), Docent **P. Brzeski**, (supervisor), (5).

[BSc32] Tomasz Leszczyński: *"Rozproszony system generowania aplikacji wspomagających proces kształcenia"* (Distributed generating system of application supporting teaching process), Assist. Prof. **K. Ignasiak** (supervisor), (5).

[BSc33] Piotr Łopatecki: *"Realizacja akustycznego wzmacniacza klasy D"* (Hardware implementation of acoustic class D amplifier), Prof. **Z. Kulka** (supervisor), (5).

[BSc34] Piotr Łukasik: *"Projekt promiennika anteny reflektorowej parabolicznej do odbioru sygnału telewizji satelitarnej"* (Project of feeder or paraboloid reflector antenna for receiving a satellite television signal), Prof. **Gwarek** (supervisor), (5).

[BSc35] Dariusz Łysyszyn: *"Wymiana danych z użyciem usługi internetowej"* (Exchange of data using web service), Assist. Prof. **K.Ignasiak** (supervisor), (5).

[BSc36] Jacek Majer: *"Impelentacja modeli głośności w środowisku MATLAB"* (A MATLAB program for computational of loudness partial loudness and loudness level), Assoc. Prof. **J. Żera** (supervisor), (5).

[BSc37] Piotr Marciniuk: *"Moduł przetwornika analogowo-cyfrowego dla magistrali CC-link"* (The cc-link analog-digital converter module), Assist. Prof. **R. Kurjata** (supervisor), (5).

[BSc38] Piotr Marek Mazur: *"Moduł oprogramowania telefonu komórkowego do współpracy z detektorem upadku"* (Module allowing connectivity between a mobile phone and a main down detection device), Assist. Prof. **M. Kazubek** (supervisor), (5).

[BSc39] Maciej Mazurowski: *"Converter from graphical to electromagnetic formats using Matlab tools"*, Assist. Prof. **A. Więckowski** (supervisor), (4).

[BSc40] Jakub Mergiel (co-author: Marcin Rolewicz): *"RICE system zdalnej interakcji czasu rzeczywistego"* (RICE remote interaction via common equipment), Prof. **W. Skarbek** (supervisor), (5).

[BSc41] Paweł Mirgos: *"Niemagnetyczny manipulator kompatybilny z rezonansem magnetycznym"* (Nonmagnetic manipulator compatibile with magnetic resonance), Assist. Prof. **R. Kurjata** (supervisor), (5).

[BSc42] Hubert Miśko: *"Modelowanie i wizualizacje przestrzenne oddziaływania promieniowania X z materią"* (Modeling and spatial visualization of x-ray interactions with matter), Assist. Prof. **B. Konarzewski** (supervisor), (5).

[BSc43] Paweł Monastyrski: *"Moduły RIS/PACS w szpitalnych systemach informatycznych"* (RIS/PACS units in hospital computerized information systems), Prof. **A. Przelaskowski** (supervisor), (5).

[BSc44] Tomasz Napiórkowski: *"Odbiornik satelitarny w paśmie 430 MHz"* (Satellite receiver in the 430 MHz band), Assist. Prof. **W. Kazubski** (supervisor), (5).

[BSc45] Adam Paweł Niziński: *"Autonomiczny rejestrator aktywności ruchowej pacjenta"* (Autonomous recorder of patient's physical activity), Assist. Prof. **R. Kurjata** supervisor, (5).

[BSc46] Oskar Olczak: *"Hardware implementation of AAC dequantization"*, Assist. Prof. **G. Pastuszak** supervisor, (4), studies in English.

[BSc47] Jan Olszak: "*Komputerowy program wspomagający pracę nauczyciela szkoły specjalnej*" (A computer program supporting a special school teacher's work), Prof. **A. Przelaskowski** (supervisor), (5).

[BSc48] Marzena Olszewska: *"Projekt pasmowo-przepustowego filtru falowodowego"* (Design of a band pass waveguide filter), Prof. **W. Gwarek** (supervisor), (5).

[BSc49] Łukasz Orlicki: *"Badanie błędów rejestracji astrometrycznych"* (Investigation of registration errors in astrometrical observation), Assist. Prof. **K. Czerwiński** (supervisor), (4).

[BSc50] Monika Osoba: *"Kodek JPEG z interfejsem do optymalizacji"* (The application for compression and decompression of images with interface for optimization), Prof. **A. Przelaskowski** (supervisor), (5), Warsaw University of Technology Distant Learning Center (Ośrodek Kształcenia na Odległość PW).

[BSc51] Paweł Jakub Pawluk: *"Bezprzewodowy, telemetryczny system nadzoru nad pacjentem – pulsoksymeter z bezprzewodową transmisją ZigBee™ "* (Wireless, telemetric monitoring system – pulsoxymeter with wireless ZigBee transmission), Assist. Prof. **R. Kurjata** (supervisor), (5).

[BSc52] Zbigniew Pomianowski: *"Zanurzenia obiektów wirtualnych w sieciach naturalnych"* (Embedding virtual objects in real scences), Prof. **W. Skarbek** (supervisor), (5).

[BSc53] Krzysztof Przeździecki: *"Zastosowanie algorytmów Huffmana w kodowaniu plików tekstowych"* (Implementation of Huffman algorithms in text coding), Assist. Prof. **K. Snopek** (supervisor), (4.5).

[BSc54] Bartosz Pyszkowski: *"Symulacja toru radiowego transmisji danych HSDPA w środowisku MATLAB-Simulink"* (HSDPA radio link simulation in MATLAB-Simulink), Assist. Prof. **K. Radecki** (supervisor), (4.5).

[BSc55] Przemysław Pytlak: *"System do wielowymia-rowej klasyfikacji wyników badań medycznych"* (System to multidimensional classification of medical research results), Assist. Prof. **B. Kona-rzewski** (supervisor), (5).

[BSc56] Bartosz Rogalski: *"Telemetryczny system moni-torowania pracy serca z wykorzystaniem transmisji danych techniką GPRS"* (Telemetric system for measurement of heart beat using GPRS technology), Senior Lecturer **T. Jamrógiewicz** (supervisor), (5).

[BSc57] Marcin Rolewicz (co-author: Jakub Mergiel): *"RICE system zdalnej interakcji czasu rzeczywistego"* (RICE remote interaction via common equipment), Prof. **W. Skarbek** (supervisor), (5).

[BSc58] Tomasz Rudzki: *"Pomiary koherencji dźwięku w pomieszczeniach"* (Measurements of coherence of sound in rooms), Prof. **Z. Kulka** (supervisor), (5).

[BSc59] Katarzyna Rusinowska: *"Płyta sygnałowa do tomografu pojemnościowego"* (Signal board to capacitance tomograph), Docent **R. Szabatin**, (supervisor), (4).

[BSc60] Andrzej Rychter: *"Wielokanałowy system do pomiaru natężenia światła"* (Multichannel system for measurement of light intensity), Assist. Prof. **G. Domański** (supervisor), (5).

[BSc61] Grzegorz Skalski: *"Telemetryczny system pomiaru podstawowych parametrow życiowych z wykorzystaniem sieci bezprzewodowych ZigBee"* (Telemetric system for measurement basic medical signals, with Zigbee wireless mesh, lead ECG and patient movement activity detection), Senior Lecturer **T. Jamrógiewicz** (supervisor), (4).

[BSc62] Michał Skrok: *"Wpływ telefonu GSM na aparaturę medyczną"* (GSM phone impact on medicine appliances), Assist. Prof. **T. Buczkowski** (supervisor), (5).

[BSc63] Bartłomiej Smoczyński: *"Projekt i realizacje systemu komunikacji radiowej, bezprzewodowej w aspekcie monitorowania stanu pacjenta w trakcie badania rezonansu magnetycznego"* (Wireless communication system designed for patient's status monitoring purposes in nuclear magnetic resonance environment), Assist. Prof. **P. Bogorodzki** (supervisor), (3.5).

[BSc64] Michał Stawiński: *"Układ stabilizacji tempera-tu-rowej wzmacniacza pracującego w paśmie ISM 2,4 GHz"* (Temperature amplifier stabilization system for frequency band ISM 2.4 GHz), Assist. Prof. **P. Kopyt** (supervisor), (5).

[BSc65] Mariusz Sucajtys: *"Przeglądarka badań bronchoskopowych"* (Bronchoscopy viewer), Prof. **A. Przelaskowski** (supervisor), (5).

[BSc66] Karol Taylor: *"Speech-driven face animation. Speech signal analysis"* (Sterowana dźwiękiem animacja twarzy. Analiza sygnału mowy), Prof. **K. Zaremba** (supervisor), (5).

[BSc67] Mateusz Woźniczka: *"Wzmacniacz mocy do modułu N/O radaru APAR na pasmo X"* (High power amplifier for X band APAR'S T/R module), Assist. Prof. **D. Gryglewski** (supervisor), (5).

[BSc68] Grzegorz Zagrajek: *"Wizualizacja badań bronchoskopowych z poprawą percepcji"* (Visualization of bronchoscopy examinations with perception improvement), Prof. **A. Przelaskowski** (supervisor), (5)

[BSc69] Piotr Zawistowski: *"Synchronizacja rozproszonego systemu pomiarowego z wykorzystaniem GPS"* (The synchronisation of a distributed measurement system with the use of GPS), Assist. Prof. **R. Łukaszewski** (supervisor), (5).

[BSc70] Bartłomiej Zommer: *"Architektura sprzętowa dekodera Reeda-Solomona"* (Hardware design of Reed-Solomon decoder), Assist. Prof. **G. Pastuszak** (supervisor), (5).

[BSc71] Piotr Zybert: *"Moduł przetwornika cyfrowo-analogowego dla magistrali CC-link"* (Analog output module for CC-link network bus), Assist. Prof. **R. Kurjata** (supervisor), (5).

[BSc72] Anna Żuchlińska: *"Wyznaczenie prędkości przepływu za pomocą ultrasonografii dopplerowskiej"* (Determination of flow velocity using Doppler ultrasonography), Prof. **K. Zaremba** (supervisor), (4).

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

[BSc73] Damian Chrzanowski: *"Projekt i realizacja zasilacza impulsowego +27V"* (The project and the realization of the switching power supply +27V), Senior Lecturer **H. Chaciński** (supervisor), (5).

[BSc74] Edyta Dębska: *"Analiza częstotliwościowa wybranych przebiegów okresowych I nieokresowych w środowisku MATLAB"* (The frequency analysis of chosen periodic and aperiodic signals using the MATLAB environment), Assist. Prof. **K. Snopek** (supervisor), (5).

[BSc75] Błażej Grzybek: *"Generator mikrofalowy do laboratorium dydaktycznego"* (Microwave oscillator for the didactic laboratory), Senior Lecturer **J. Skulski** (supervisor), (5).

[BSc76] Przemysław Lewandowski: *"Projektowanie małosygnałowych wzmacniaczy mikrofalowych – aplikacja do zastosowań dydaktycznych"* (Designing low signal microwave amplifiers – application for educational purposes), Assist. Prof. **J. Dawidczyk** (supervisor), (4.).

[BSc77] Karol Prarat: *"Syntezer częstotliwości na pasmo 9,1GHz-9,6GHz"* (Frequency synthesizer at 9.1GHz-9.6GHz), Assist. Prof. **D. Gryglewski** (supervisor), (4.5).

[BSc78] Martyna Świesiulska: *"Układ syntezy z pętlą na częstotliwość 44.988 MHz"* (44.988 MHz frequency synthezier with PLL loop), Assist. Prof. **W. Kazubski** (supervisor), (5).

[BSc79] Jakub Trojanowski: *"Odbiornik radiowy do pomiaru poziomu sygnału w lotniczym paśmie nawigacyjnym"* (Radio receiver for measurement of signal level in navigational air-band VHF), Assist. Prof. **W. Kazubski** (supervisor), (5).

6 PUBLICATIONS

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[Pub8] T. Podsiadły-Marczykowska, A. Przelaskowski „Evaluation of MammoEdit, an Aiding Tool for Mammogram Interpretation Using MRMC ROC Methodology", *Image Processing & Communication Challenges*, A*cademy Publishing House EXIT* , Warsaw 2009, pp 374-381

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[Pub165] Y. Yashchyshyn: „State-of-the-Arts Reconfigurable Antennas – Principles, Devices, Applications", *Proc. International Conference on Antenna Theory and Techniques: ICATT 2009* (Lviv, Ukraine, Oct. 6-9, 2009), pp. 25-30, invited paper.

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[Pub181] M. Lewandowska, E. Piątkowska-Janko, P. Bogorodzki, T. Wolak, E. Szeląg: "The Effect of Fast For Word Training on Brain Activation During Temporal Information Processing: an fMRI Study" *Proc. 41st European Brain & Behavior Society Meeting*, (Rhodes Island, Greece, Sept. 13-18, 2009), 1 p.

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[Pub190] M. Sołtysiak, M. Celuch, U. Erle: "Multiphysics Simulations of Microwave Heating Phenomena in Domestic Ovens", *Proc. PIERS 2009*, (Moscow, Russia, Aug. 18-21, 2009), p. 399.

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6.4.1 Other publications

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[Pub195] Z. Kulka: "Mikrofony cyfrowe" (Digital Microphones), *Radioelektronik Audio-HiFi-Video*, no. 6 (2009), pp. 6-7.

[Pub196] J. Modelski: "Polska cyfryzacja", *TV Lider*, no. 9/10, vol. 43 (2009), p. 8.

[Pub197] Y. Yashchyshyn: "Principle of Smart Antennas and Selected Applications", *Proc. 19th International Traveling Summer School on Microwaves and Lightwaves* (Rome, Italy, Jul. 4-10, 2009), pp. 202-241.

6.5 Books and special issues edited by the staff

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7 RESEARCH REPORTS

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[Rep4] W. Gwarek, D. Gryglewski P. Kopyt, W. Wojtasiak: *"Przewidywalny wpływ planowanego terminala pasażerskiego we Wrocławiu na wskazania radarów będących w zarządzaniu Polskiej Agencji Żeglugi Powietrznej* (Prediction of the Influence of the Planned Passenger Airport Terminal in Wrocław on the Radars Operated by Polish Air Navigation Services Agency), Final report for Wroclaw Airport Ltd. (Port Lotniczy Wrocław, Spółka Akcyjna), Warsaw, Jun. 2009.

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[Rep6] T. Kosiło, J. Modelski, J. Kołakowski, R. Michnowski, J. Cichocki, P. Makal, Z. Walczak:*"Cooperative Systems for Road Safety "Smart Vehicles on Smart Road"*, Final report for EU Integrated Project: SAFESPOT, WUT, Warsaw, Dec. 2009.

[Rep7] Z. Kulka, P. Bobiński, E. Kotarbińska, A. Leszczyński, A. Młyńska, M. Tajchert, J. Żera: *"Projektowanie i badania systemów elektroakustycznych oraz systemów cyfrowego przetwarzania sygnałów fonicznych"* (Design and Investigation of Electroacoustics Measuring Systems), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Oct. 2009.

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[Rep15] A. Przelaskowski: *"System telediagnostyki obrazowej"* (Image Telediagnostic System), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Oct. 2009.

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[Rep19] W. Skarbek, K. Wnukowicz, G. Galiński, M. Jędryka: *"Opracowanie i rozwój technologii i oprogramowania do opisu, wyszukiwania i rekomendacji wideo"* (Development of Video Description Matching and Recommendation Technologies and Software)*, Final report for Mitsubishi Electric ITE VIL, UK, Mar. 2009.

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[Rep22] J. Wojciechowski, Z. Walczak, A. Dominik, M. Czajko: *"Badania w zakresie sieci i eksplo-racji danych"* (Investigations of Networks and Data Exploration), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Oct. 2009.

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[Rep24] K. Zaremba, P. Bogorodzki, P. Brzeski, G. Domański, T. Jamrógiewicz, M. Kazubek, B. Konarzewski, J. Marzec, T. Olszewski, E. Piątkowska-Janko, D. Radomski, W. Smolik, R. Szabatin, R. Kurjata, A. Trybuła: *"Nowoczesne techniki elektroniki jądrowej i medycznej"* (Modern Techniques in Nuclear and Medical Electronics), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Oct. 2009.

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[Rep26] K. Zaremba: *"Analiza innowacyjności w postaci przygotowanego dokumentu opinii o innowacyjności projektu "Niszczenie guzów nowotworowych przy użyciu robota*" (Analysis of the Innovation Level of the Project „Destruction of Tomours Using a Robot"), Final report for Institute of Cybernetic Surgery (Instytut Chirurgii Cybernetycznej), Warsaw, Oct. 2009.

PATENTS

[Pat1] M. Szafran, E. Bobryk, J. Modelski, Y. Yashchyshyn: *Kompozyt ceramika-polimer do zastosowań mikrofalowych i sposób wytwarzania kompozytu ceramika-polimer do zastosowań mikrofalowych"*, Polish patent, No. 363196, Jan. 30, 2009.

8 SCIENTIFIC EVENTS

8.1 Scientific events co-organized by the Institute

[Con1] *12th National Symposium of Radio Sciences URSI 2009* (Warsaw, Poland, Jun. 16-17, 2009).

[Con2] *Krajowa Konferencja Radiokomunikacji, Radiofonii i Telewizji: KKRRiT'2009 (National Conference on Radiocommunications and Broadcasting)*, (Warsaw, Poland, Jun. 17-19, 2009).

8.2 International scientific events

[Con3] *FP7-ICT Proposers' Day 2009*, organized by The European Commission's Information Society and Media Directorate-General (Budapest, Hungary, Jan. 22, 2009), T. Buczkowski (proposer), P. Bogorodzki, E. Piątkowska-Janko (participants).

[Con4] *European Cubesat Workshop* (Noordwijk, the Netherlands, Jan. 19-23, 2009), K. Kurek (participant).

[Con5] *Occupational Safety and Hygiene: Symposium: SHO 2009* (Guimarães, Portugal, Feb. 5-6, 2009), E. Kotarbińska (member of the Organizing committee, speaker).

[Con6] *Fairchild Power Seminar*, Arrow Electronics (Warsaw, Poland, Feb. 23, 2009), T. Buczkowski (participant).

[Con7] *5th GCC IEEE Conference* (Kuwait, Mar. 17-19, 2009), J. Modelski (welcome address speaker).

[Con8] *3rd European Conference on Antennas and Propagation: EuCAP 2009* (Berlin, Germany, Mar. 23-28, 2009), Y. Yashchyshyn (speaker), P. Bajurko, M. Bury, S. Kozłowski (participants).

[Con9] *MIRAGE 2009* (Paris, France, May 3-7, 2009), M. Tomaszewski (speaker).

[Con10] *IX International Electronics and Telecommunication Conference of Students and Young Scientists: SECON 2009* (Warsaw, Poland, Mar. 10-12, 2009), C. Jezierski (participant).

[Con11] *Workshop Sensor Networks for Earth and Space Science Applications: ESSA 2009* (San Francisco, USA, Apr. 16, 2009), M. Czajko (participant).

[Con12] *IEEE I2MTC Conference* (Singapore, Apr. 30, May 7, 2009), W. Winiecki (speaker).

[Con13] *SPIE Conference* (Monterey, USA, May 5-6, 2009), B. Salski (participant).

[Con14] *European Ground System Architecture Workshop* (Darmstadt, Germany, May 5-6, 2009), M. Stolarski (participant).

[Con15] *IEEE International Workshop on Imaging Systems and Techniques: IST 2009* (Shenzhen, China, May 9-14, 2009), W. Smolik, P. Czarnecki (participants).

[Con16] *IEEE EuroCon 2009* (Saint-Petersburg, Russia, May 18-23, 2009), J. Modelski (welcome address speaker).

[Con17] *XXIVth International IEEE-SPIE Joint Symposium on Photonics, Web Engineering, Electronics for Astronomy and High Energy Physics Experiments* (Wilga Resort, Poland, May 25-31, 2009), W. Winiecki (speaker).

[Con18] *7th International Symposium on Non-invasive Functional Source Imaging of the Brain and Heart* (Rome, Italy, 28-31 May, 2009), P. Bogorodzki (participant).

[Con19] *IYC'09 International Youth Conference on Energetics* (Budapest, Hungary, Jun.4-6, 2009), J. Modelski (welcome address speaker).

[Con20] *6th International Conference on Computer Recognition Systems: CORES 2009* (Jelenia Góra, Poland, May 25-28, 2009), G. Ostrek (participant).

[Con21] *2009 International Microwave Symposium on IEEE Microwave Theory and Techniques Society: IEEE MTT-S IMS* (Boston, USA, Jun. 7-12, 2009), J. Modelski (member of Technical Paper Review Committee), M. Celuch (member of Technical Paper Review Committee; co-organizer of Workshop WFC: "Recent Advances in Microwave Power Applications and Techniques RAMPAnT), W. Gwarek (speaker).

[Con22] *CORS-INFORMS International Meeting: TORONTO'09* (Toronto, Canada, Jun. 14-17, 2009), J. Wojciechowski (session chair, speaker).

[Con23] *Photon Detectors 2009* (Matsumoto, Japan, Jun. 24-26, 2009), R. Kurjata (participant).

[Con24] *International Conference on Signal Processing and Multimedia Applications: SIGMAP 2009* (Milan, Italy, Jul. 6-11, 2009), M. Jakubowski (participant).

[Con25] *11th European Congress of Psychology* (Oslo, Norway Jul. 7-10, 2009), M. Lewandowska, E. Szeląg (participants).

[Con26] *4th International Conference on Broadband Communication, Information Technology & Biomedical Applications: BroadBandCom'09* (Wroclaw, Poland, Jul. 15-18, 2009), J. Kołakowski (speaker).

[Con27] *Progress in Electromagnetic Research Symposium: PIERS* (Moscow, Russia, Aug. 18-22, 2009), M. Celuch (speaker).

[Con28] *30th Annual Conference of the International Society for Clinical Biostatics* (Prague, Czech Republic, Aug. 23-28, 2009), D. Radomski (participant).

[Con29] *International Scientific Conference on Physics & Control* (Catania, Italy, Aug. 31-Sept. 4, 2009), Z. Szymański (participant).

[Con30] *IMEKO World Congress* (Lizbona, Portugal, Sept. 5-12, 2009), W. Winiecki, P. Bilski, P. Bobiński, J. Olszyna (speakers), R. Z. Morawski (speaker, session chairman, round table animator, member of international programme committee).

[Con31] *International Conference on Microwave and High Frequency Heating: AMPERE 2009* (Karlsruhe, Germany, Sept. 7-11, 2009), P. Kopyt (participant).

[Con32] *9th International Congress of the Polish Neuroscience Society (*Warsaw, Poland, Sept. 9-12, 2009), P. Bogorodzki (participant).

[Con33] *IBC 2009* (Amsterdam, the Netherlands, Sept. 11-14, 2009), J. Jarkowski (participant).

[Con34] *41th European Brain & Behavior Society Meeting* (Rhodes Island, Greece, Sept. 13-18, 2009), M. Lewandowska, E. Szeląg (participants).

[Con35] *IEEE 5th Workshop: IDAACS'2009* (Rende, Italy, Sept. 19-24, 2009), W. Winiecki (member of the International Program Committee, member of the International Advisory Board, speaker).

[Con36] *IEEE AfriCon 2009* (Nairobi, Kenya, Sept. 23-25, 2009), J. Modelski (welcome address speaker).

[Con37] *European Microwave Week 2009* (Rome, Italy, Sept. 29-Oct. 3, 2009), J. Modelski (member of the Program Committee, session chair), Y. Yashchyshyn, J. Kołakowski, P. Makal (participants).

[Con38] *ESMRMB 2009* (Antalya, Turkey, Sept. 30-Oct. 4, 2009), E. Piątkowska-Janko, P. Bogorodzki (participants).

[Con39] *The 7th International Conference on Antenna Theory and Technique: ICATT 2009* (Lviv, Ukraine, Oct. 6-9, 2009), Y. Yashchyshyn, P. Bajurko (participants).

[Con40] *XIII Międzynarodowe Sympozjum Reżyserii i Inżynierii Dźwięku: ISSET 2009* (XIIIth International Symposium on Sound Engineering and Tonmeistering), (Warsaw, Poland, Oct. 16-18, 2009), Z. Kulka (member of the Scientific Committee, speaker), P. Bobiński, M. Lewandowski, R. Korycki (speakers), M. Tajchert, J. Żera (participants).

[Con41] *IEEE COMCAS 2009, International Conference on Microwaves, Communications, Antennas and Electronic Systems* (Tel-Aviv, Israel, Nov. 9-11 , 2009), J. Modelski (welcome address speaker).

[Con42] *3rd International Forum on Innovative Technologies for Medicine: ITMED 2009* (Białystok, Poland, Dec. 1-3, 2009), K. Zaremba (deputy chairman of scientific matters).

8.3 National scientific events

[Con43] *FP7-ICT Proposers' Day 2009,* Organised by The European Commission's Information Society and Media Directorate-General, (Budapest, Hungary, (Jan. 22, 2009), T. Buczkowski (proposer).

[Con44] *Fairchild Power Seminar*, Arrow Electronics, (Warsaw, Poland, Feb. 23, 2009), T. Buczkowski (participant).

[Con45] Konferencja "Rozwój firm innowacyjnych w Polsce. Szanse i Bariery" (Development of Innovative Firms in Poland. Chances and Barriers) (Warsaw, Poland, May, 12, 2009), T. Buczkowski (participant).

[Con46] *FP7 - Conference " Green Car Initiative", The Polish National Contact Point for Research Programmes of the European Union (KPK),* (Warsaw, Poland, May 26, 2009), T. Buczkowski (participant).

[Con47] *Konferencja "Kosmos 2009 – Człowiek w podróży"* (Universe 2009 – Man in Travel), Computerworld, ARM S.A. Agency for Development of Mazovia (Warsaw, Poland, Jun. 3), 2009, T. Buczkowski (participant).

[Con48] *VIII Krajowa Konferencja Elektroniki – KKE 2009* (VIIIth National Conference on Electronics), (Darłowo, Poland, Jun. 7-10, 2009), T. Morawski, J. Wojciechowski) members of the Scientific Committee, J. Modzelewski, J. Zborowska (speakers).

[Con49] *12th National Symposium of Radio Sciences URSI 2009* (Warsaw, Poland, Jun. 16-17, 2009), S. Hahn (chair of the Scientific Committee), T. Kosiło, K. Radecki (members of the Scientific Committee), H. Chaciński, W. Kazubski, P. Makal, K. Snopek, Y. Yaschyshyn (participants).

[Con50] *Krajowa Konferencja Radiokomunikacji, Radiofonii i Telewizji: KKRRiT'2009* (National Conference on Radiocommunications and Broadcasting)*,* (Warsaw, Poland, Jun. 17-19, 2009), J. Modelski (chairman of the Program Committee), J. Cichocki (chairman of the Organizing Committee), K. Ignasiak, K. Snopek, S. Żmudzin, A. Czarnecka (members of the organizing Committee), A. Buchowicz, H. Chaciński, G. Galiński, J. Jarkowski, W. Kazubski, T. Keller, J. Kołakowski, T. Kosiło, K. Kurek, P. Makal, R. Michnowski, K. Płatek, K. Radecki, W. Skarbek, Y. Yashchyshyn, P. R. Bajurko, K. Bryłka, M. Dąbrowski, R. Graczyk, C. Jezierski, M. Jędryka, M. Jakubowski, S. Kozłowski, A. Lewandowski, M. Leszczyński, P. Makal, A. Nowakowski, M. Stolarski, K. Wnukowicz, M. Tomaszewski, P. Ziętek (participants).

[Con51] *Krajowa Konferencja Naukowa: Postępy w Elektronice Stosowanej: PES-7* (National Scientific Conference: Advances in Applied Electronics), (Kościelisko, Poland, Jun. 22-26, 2009), J. Modzelewski (speaker).

[Con52] *XLI Międzyuczelniana Konferencja Metrologów: MKM 2009* (Inter-University Metrologists' Conference), (Gdańsk, Poland, Aug. 30-Sept. 2, 2009), W. Winiecki, R. Łukaszewski (speakers).

[Con53] *FP7 - Security, ICT, Transport – 3rd Call – Information Day, The Polish National Contact Point for Research Programmes of the European Union (KPK),* (Warsaw, Poland, Sept. 8, 2009), T. Buczkowski (participant).

[Con54] *FP7 - Energy, NMP (Nanosciences&Nanotechnologies, Materials and Production), Environment, Space – 3rd Call – Information Day, The Polish National Contact Point for Research Programmes of the European Union (KPK), IPPT* (Warsaw, Poland, Sept. 10, 2009), T. Buczkowski (participant).

[Con55] *56 Otwarte Seminarium z Akustyki* (56 Open Seminar on Acoustics), (Goniądz by the river Biebrza, Sept. 15-18, 2009), Z. Kulka (member of the Scientific Committee), J. Żera (member of the Organising Committee).

[Con56] *III Konferencja Naukowa: Urządzenia i Systemy Radioelektroniczne* (IIIrd Scientific Conference: Devices and Radioelectronic Systems), (Soczewka, Poland, Sept. 23-25, 2009), W. Woj-j-tasiak, D. Gryglewski (participants).

[Con57] *XXXV Konferencja i Wystawa Polskiej Izby Komunikacji Elektronicznej PIKE2009* (XXXV Conference and Exhibition of Polish Chamber of Electronics Communication), (Ossa, Poland, Oct. 18-20, 2009), J. Modelski (moderator).

[Con58] *Konferencja Naukowo-Techniczna: Zintegrowany Transport Publiczny w Obsłudze Miast i Regionów* (IV Conference: Integrated Public Transport in Towns and Region Service*),* (Zakopane, Poland, Oct. 27-29, 2009), T. Kosiło (speaker).

[Con59] *FP7 – ICT – 6th Call – Information Day, The Polish National Contact Point for Research Programmes of the European Union (KPK), IPPT* (Warsaw, Poland, Nov. 24, 2009), T. Buczkowski (participant).

[Con60] *Otwarty Rynek Kolejowy w Polsce* (Open Railway Trade in Poland), (Warsaw, Poland, Dec. 1, 2009), J. Modelski (member of the Programme Committee), T. Kosiło, T. Keller (speakers).

[Con61] *XLII Ogólnopolskie Seminarium na Temat Magnetycznego Rezonansu Jądrowego i Jego Zastosowań* (Kraków, Poland, Dec. 1-2, 2009), P. Bogorodzki, E. Piątkowska-Janko, B. Sawionek, K. Kamińska, S. Adaszewski, Ł. Kołaszewski, W. Obrębski (participants).

[Con62] *X Seminarium: Radiokomunikacja i Techniki Multimedialne* (X[th] Seminar: Radiocommunications and Multimedia Technologies), (Warsaw, Poland, Dec. 2, 2009), A. Abramowski, P. Bajurko, M. Bury, G. Błoński, S. Kozłowski, M. Leszczyński, J. Naruniec, A. Nowakowski, M. Roszkowski, B. Sas, T. Symonides, M. Wieczorek (speakers).

9 AWARDS AND DISTINCTIONS

State Medals

Ewa Kotarbińska, Ph.D.,

Srebrny Krzyż Zasługi (Silver Order of Merit)

Tomasz Kosiło, Ph.D., Docent,

Medal Komisji Edukacji Narodowej (Medal of National Education Committee)

Andrzej Skrzypkowski

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

Award of the Minister of Science and Higher Education

Stanisław Rosłoniec, Prof. D.Sc.,

Individual award II^0 for the books: *"Wybrane metody numeryczne z przykładami zastosowań w zadaniach inżynierskich"* (Selected Numerical Methods with the Examples of Applications in Engineering Tasks), *"Fundamental Numerical Methods for Electrical Engineering"*.

Award of the Minister of Sport and Tourism

Wiesław Winiecki, Prof. D.Sc.,

Silver Badge for the Merits in Sport (Srebrna Odznaka za Zasługi dla Sportu).

Golden Award of the Polish Federation of Engineering Associations – NOT

Józef Modelski, Prof. D.Sc.,

Awards by International Organizations

Waldemar Smolik, Ph.D.,

Best Poster at *IEEE International Workshop on Imaging Systems and Techniques* (Shenzhen, China, May 11-12, 2009).

Małgorzata Celuch, Ph.D.,

The IMS 2009 Highest Quality Workshop Award for Workshop "Recent Advances in Microwave Power Applications and Techniques" (RAMPAnT)".

Awards of the Rector

Jacek Wojciechowski, Prof. D.Sc.,

Individual award I^0 for the book: *"Sygnały i systemy"* (Signals and Systems).

Józef Modelski, Prof. D.Sc.,
Yevhen Yashchyshyn, Prof. D.Sc.,
Krzysztof Derzakowski

Team award I^0 for research performance in 2007-2008

Wiesław Winiecki, Prof. D.Sc.,

Warsaw University of Technology, Person of Merit (Zasłużony dla Politechniki Warszawskiej).

Dariusz Radomski, Ph.D.,

Individual award III^0 for organization achievements in academic year 2008 / 2009.

Award of students of the Faculty

Krzysztof Zaremba, Prof. D.Sc.

"Golden Chalk" Award.

Awards granted for the conference papers and posters

Cezary Jezierski

For winning 2nd place in Best Paper Competition in Young Scientists Group at *IX International Electronics and Telecommunication Conference of Students and Young Scientists* (Warsaw, Poland, Mar. 10-12, 2009).

Scholarships granted by Foundation for the Development of Radiocommunication and Multimedia Technologies

For preparing Ph.D. thesis
Mariusz Leszczyński,
Jacek Naruniec,
Artur Nowakowski,

For preparing M.Sc. thesis
Andrzej Abramowski,
Grzegorz Błoński,
Bartosz Majewski.
Marzena Olszewska,
Mikołaj Roszkowski,
Barbara Sas,
Tomasz Symonides,
Michał Wieczorek,
Rafał Wojda.

For preparing B.Sc. thesis
Aleksandra Spik.

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

SPECIFICATION	2005	2006	2007	2008	2009
academic staff [posts]					
total	61.58	61.08	60.5	64.5	67.05
tenured professors	3,4	2,75	4	5	5
professors	7,6	9	7	7	8
associate professor	2,5	2,5	2,5	1,5	0,5
assistant professors	42,5	41,5	39,5	40,75	41,85
docents	-	-	2	4	4
senior lecturers	4.,3	4,83	4,5	4,5	4,5
assistants	1	0.,	1	1,75	3,2
Ph.D. Students [persons]					
total	38	44	34	43	36
regular, the third level studies	24	20	13	23	23
without scholarship	14	24	21	20	13
technical and administrative staff [posts]					
total	20,04	20,06	18,1	18,25	23,2
senior R&D associates					2,85
R&D associates	8,9	11,6	8,6	8,25	10,6
administrative associates	8,5	6	6,5	7	7
librarian	1	1	1	1	0,75
service workers	2	2	2	2	2
Space [m²]					
total			3069.6		
laboratories			1320.0		
library			81.1		
offices of academic staff			1355		
library resources					
books (volumes)	15344	15501	15530	15785	15924
books (titles)	8353	8459	8488	8662	8774
journals (subscriptions)	126	126	126	126	126
teaching activities					
basic courses	60	62	62	61	63
advanced courses	33	22	22	25	25
other courses	80	66	60	57	58
international course projects	6	1	4	1	2
research projects					
total	41	51	52	48	48
International	6	10	8	9	9
granted by Ministry	11	13	15	16	15
granted by the University	15	17	17	18	18
other	9	11	12	5	9
research projects budget PLN:	4 397 000	5 020 000	4 833 000	5 712 877	6 853232
Euro:	331 000	323 000	495 000	211 000	-
titles and degrees awarded					
D.Sc. degree	-	1	-	-	-
Ph.D. degree	5	9	5	4	6
M.Sc. degree (regular studies + evening studies)	50	64+3	63+3	75+2	67+8
M.Sc. degree (studies in English)	-	1	1	-	-
B.Sc. degree (regular studies + evening studies)	51+14	68+10	55+16	47+10	65+7
B.Sc. degree (studies in English)	7	3	4	5	5
B.Sc. degree (distant learning)	-	2	1	1	2
publications					
total	224	235	229	194	197
sci.-tech. books and chapters in books	6	5	1	12	12
sci.-tech. papers in journals – total	65	61	82	92	100
JCR-ICI list (IF>0)	22	13	32	39	21
MSHE list	26	16	32	49	72
in other journals	17	32	18	4	7
sci.-tech. papers in conference proceedings	131	149	131	69	58
other publications	19	22	15	21	27
research reports	27	35	38	27	26
conferences attended by the staff	48	50	56	52	60

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

According to Polish law, the following terms are used for academic and professional titles, degrees and posts held by staff members at the Institute of Radioelectronics.

The academic title of ***profesor (prof.)***, is conferred by the president of the Republic of Poland upon a motion of the Central Commission for Academic Degrees and Title.
This title may be awarded to a person who:
- has obtained a degree of *doktor habilitowany*;
- has scientific achievements, which fall far beyond the requirements for the candidates applying for the degree of doktor habilitowany;
- has remarkable didactic achievements, among other things, within the scope of training of academic staff.

Academic degrees awarded by the organizational unit entitled to confer such degrees, it means the respective Faculty Council or another organizational unit of a higher education institution or another scientific institution.
- ***doktor (dr)***, translated here as **Ph.D.**, is conferred to a person who:
  - holds the professional title of *magister* or *magister inżynier*;
  - has successfully passed doctorate examinations covering the scope defined by faculty board; and
  - has submitted and successfully defended a doctoral thesis assessed favorably by two reviewers.

The doctoral dissertation, prepared under the supervision of a tutor, should provide an original solution of a scientific problem and present general theoretical knowledge of the candidate in a given discipline of science, as well as should confirm the candidate's skill to conduct scientific work independently
- ***doktor habilitowany (dr hab.)***, translated here as **D.Sc.**, is conferred to a person who:
  - holds the academic degree of *doktor*;
  - has remarkable scientific achievements;
  - has submitted a habilitation dissertation which contributes significantly to the development of a given scientific discipline;
  - has received favorable assessment of his/her dissertation from four reviewers;
  - has passed a habilitation examination; and
  - has delivered a favorably assessed habilitation lecture.

The dissertation may constitute a work completed by candidate after he/she was awarded the degree of *doktor*. This work should be also published as a whole or in its fundamental part.
The *doktor habilitowany* degree authorize the holder to promote doctoral theses.

Research and teaching posts:
- ***asystent*** – *magister* professional title is required;
- ***adiunkt*** – *doktor* degree is required;
- ***profesor nadzwyczajny*** – *doktor habilitowany* degree is required;
- ***profesor zwyczajny*** – *profesor* title is required.

Teaching posts:
- ***wykładowca***, translated here as **Lecturer**;
- ***starszy wykładowca***, translated here as **Senior Lecturer**,
- ***docent*** – *doktor* degree is required;

Professional titles:
- ***inżynier (inż.)***, translated here as **B.Sc.**, are awarded to the graduates of higher vocational studies in the technical fields of study when the technical subjects constitute not less than 50% of the total of didactic activities included in the timetable for this fields of study;
- ***magister (mgr)***, translated here as **M.Sc.**, are awarded to the graduates of master-level courses in such fields of studies as: natural sciences, mathematics etc.;
- ***magister (mgr)***, translated here as **M.A.**, are awarded to the graduates of master-level courses in the arts and humanities fields of studies.
- ***magister inżynier (mgr inż.)***, translated here as **M.Sc.**, are awarded to the graduates of master-level courses in the technical fields of studies.

The following English titles have been adopted here for Polish academic posts:
- **Assistant** – the holder of the *magister inżynier* professional title in the post of *asystent*;
- **Assistant Professor** – the holder of *doktor* degree in the post of *adiunkt*;
- **Docent** – the holder of *doktor* degree in the post of *docent*;
- **Associate Professor** – the holder of *doktor habilitowany* degree in the post of *adiunkt*;
- **Professor** – the holder of *doktor habilitowany* degree in the post of *profesor nadzwyczajny*;
- **Tenured Professor** – the holder of a *profesor* academic title in the post of *profesor zwyczajny*.