



INSTITUTE OF RADIOELECTRONICS
WARSAW UNIVERSITY OF TECHNOLOGY
FACULTY OF ELECTRONICS AND INFORMATION TECHNOLOGY



ANNUAL REPORT

2008

Warsaw, January 2009

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From the Director

Welcome to the 2008 edition of our Annual Report!

Looking back over the past year, I can certainly state that our Institute went through another year of intensive actions and successful initiatives, which were appreciated and lavishly awarded by the national and international worlds of academia and industry. This positive trend of continual effort, growth and advancement on behalf of our employees deserves an even greater acclaim, since we all know how difficult it is to function and succeed in the difficult Polish reality with no clear vision and stable legal and economical situation within the science and education field.

Undoubtedly, the chief asset of the Institute is our outstanding staff. It is their self-motivation, high purpose and great enthusiasm in their approach to all their activities, that guarantee the international renown they cherish. They have, for many years, been the pride and joy of the Institute and being chairs of various world-known organizations and associations or sitting on boards of TPC's of leading international conferences have been spreading its good name all over the world. Therefore, last year, likewise the few previous ones, abounded in our professors receiving numerous national and international awards and prizes for their achievements. First and foremost, one of our research teams received the European most prestigious prize in the field of microwaves for the new original types of reconfigurable antenna. We are all the more proud, as the reception of this highly prestigious prize was a precedent case among the representatives of Central-Eastern Europe academia.

Institute has, for a long time, been known as the leading school of radioelectronics engineers, which is our continual source of joy and satisfaction. Despite the globally visible inflation in the technical education degree, 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 2008, many of our lecturers were awarded for their teaching achievements. To mention a few, Marek Rusin, Ph.D., received the Medal of the *National Education Commission* and Jerzy Kołakowski, Ph.D. was awarded *Golden Chalk* distinction for the best lecturer at our Faculty.

The staff of the Institute realized many scientific projects on the bases of the European Framework Programmes. Such projects as *CODMUCA Core Subsystem for Delivery of Multi-band Data in CaTV* and *ACE Antenna Centre of Excellence* were completed, and some have been continued, e.g. *RESOLUTION Reconfigurable Systems for Mobile Local Communications and Positioning* and *SAFESPOT Cooperative Systems for Road Safety "Smart Vehicles on Smart Road"* and *VISNET Networked Audiovisual Media Technologies*. Also, the long-term collaboration between the Institute of Radioelectronics and foreign scientific centres, e.g. CERN, has also continually extended our horizons. Recently, the Division of Nuclear and Medical Electronics established the co-operation with one of the Japanese scientific centres and joined the international T2K neutrino experiment.

Beside the realization of many international projects, the Institute was also involved in numerous domestic ones, which were either centrally funded, to mention, in particular, the development grants such as *Multi-antenna Broadband Radiocommunication and Radiolocation Systems* and *Design of High Power Microwave Devices with SiC and GaN Components* or carried out in co-operation with national institutions, e.g. *Digital Radio Broadcasting – Project Tools and Methods, Test Emissions* realized together with the National Institute of Telecommunications. Concurrently,

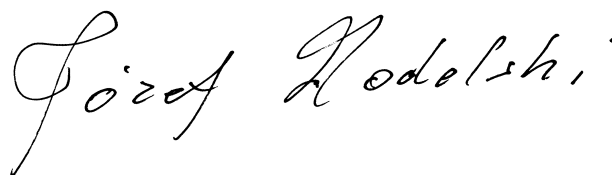
our employees were running remunerative national and international projects with industrial companies and telecommunication operators. The most successful in the area of domestic ones was Wojciech Wojtasiak, Ph.D., who coordinated the project with NETIA S.A. consisting in conversion of bands in point to multipoint systems. All the new developments which have and will come as a result of these initiatives, will contribute to the Institute's image of an indisputable leader in its disciplines.

As a consequence of the projects realization and outcomes, our staff remain active in the publishing field. Throughout 2008, the Institute's teams released publications covering the areas of radiocommunications, multimedia, microwave, acoustics and medical electronics. Our professors were the authors or co-authors of about 200 publications. We are especially content with the fact that our students as well as professionals can extend and update their knowledge basing on the newly published text books and monographs. Our employees also publish frequently referenced papers, are invited with their presentations to the world's leading conferences and research centers, as well as act as reviewers for high-class academic journals.

Conducting advanced research, which additionally results in producing higher number of scientific publications, could not have been possible without a richly equipped laboratory base, which high profile measurement and control aperture is constantly upgraded and expanded, basing on our own resources, grants as well as donations from commercial institutions. *The Foundation for Development of Radiocommunications and Multimedia Technologies* has been playing a major role in this matter in the last decade. The Institute is perceived as the unit which, as one of the last among the technical universities, has preserved its tradition in educating also the hardware engineers. Our strong laboratory base constitutes a vehicle to provide interactive teaching or problem-related research and stimulate participation in various projects as well as attract engineering contracts. It also allows us to vary our educational offer accordingly and organize evening, extra-mural as well as the in-house courses RADEM, which cover a wide choice of subjects of the most in request categories: radiocommunications, multimedia and biomedical engineering.

The Institute of Radioelectronics will not cease in the efforts to drive its targets further on, and will look for new concepts and ideas to take full advantage of its human resources potential. We are also deeply grateful and would like to thank our partners, friends, supporters and sponsors of our activities for their incessant interest and assistance over all those years.

Warsaw, January 2009

A handwritten signature in black ink, reading "Józef Modelski". The script is cursive and elegant, with the first letter 'J' being particularly large and stylized.

Professor Józef Modelski

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This Annual Report summarizes the research activities of the Institute in 2008, as well as the teaching activities of the academic year 2007/2008

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 Bobiński, Ph.D., Assistant Professor
 Ewa Kotarbińska, Ph.D., Assistant Professor (0.5)
 Andrzej Leszczyński, Ph.D., Assistant Professor (0.25)
 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 R&D Eng. (0.5)
 Piotr Nykiel, M.Sc., Senior Development Engineer (0.5)

Ph.D. students

Paweł Czernik, M.Sc., from Oct. 2008
 Rafał Korycki, M.Sc., from Feb. 2007
 Marcin Lewandowski, M.Sc., from Feb. 2008
 Aleksandra Młyńska, M.Sc., from Oct. 2004
 Jakub Olszyna, M.Sc., from Feb. 2008
 Marcin Stolarski, M.Sc., from Oct. 2004
 Aneta Świercz, M.Sc., from Oct. 2002

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:

- fundamentals 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

Head of Division

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 Stanisław Rosłonec, Prof. D.Sc., Professor
 Małgorzata Celuch, Ph.D., Assistant Professor
 Daniel Gryglewski, Ph.D., Assistant Professor
 Paweł Kopyt, Ph.D., Assistant Professor (from Sept. 1, 2008)
 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
 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 2008 included: design of high-frequency systems for radar techniques and radio-communications (oscillators, synthesizers, modulators, amplifiers, high-power noise sources, 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 for application in

aeronautics; methods for measurements of electric and magnetic properties of materials at microwave frequencies; development of numerical methods and implementation of computer programs for full-wave analysis and design of two- and three-dimensional microwave circuits (filters, periodic guiding structures, matching circuits, structures incorporating dispersive and anisotropic media, antennae); methods of coupled electromagnetic-thermodynamic simulations, design of microwave heating applicators; methods of coupled electromagnetic-optical modelling; 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
 Bogumił Konarzewski, Ph.D., Assistant Professor
 Robert Kurjata, Ph.D., Assistant Professor
 Ewa Piątkowska-Janko, Ph.D., Assistant Professor
 Dariusz Radomski, Ph.D., Assistant Professor
 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

Ph.D. students

Maciej Bielecki, M.Sc., from Oct. 2008
 Piotr Czarnecki, M.Sc., from Oct. 2007
 Michał Dziewiecki, M.Sc., from Oct. 2005
 Wojciech Obrębski, M.Sc., from Oct. 2008
 Wojciech Padée, M.Sc., from Oct. 2004
 Lech Raczyński, M.Sc., from Oct. 2006
 Tymon Rubel, M.Sc., from Oct. 2003
 Andrzej Smolnik, M.Sc., from Oct. 2008
 Krzysztof Woźniak, M.Sc., from Oct. 2006
 Marcin Ziembicki, M.Sc., from Mar. 2004

Retired:

Zdzisław Pawłowski, Prof. D.Sc.

Waldemar Scharf, Ph.D.

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.

1.3.4 Radiocommunications Division

Head of Division

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 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
 Karol Radecki, Ph.D., Assistant Professor
 Kajetana Snopek, Ph.D., Assistant Professor
 Zbigniew Walczak, Ph.D., Assistant Professor
 Henryk Chaciński, M.Sc., Senior Lecturer

Technical staff

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

Ph.D. students

Paweł Bajurko, M.Sc., from Oct. 2004
 Kamil Bryłka, M.Sc., from Oct. 2006
 Marek Bury, M.Sc., from Oct. 2004
 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
 Sebastian Kozłowski, M.Sc., from Oct. 2004
 Piotr Makal, M.Sc., from Feb. 2008
 Andrzej Piętaś, M.Sc., from Oct. 2008
 Paweł Ziętek, M.Sc., from Oct. 2006

Retired:

Jan Ebert, Prof. D.Sc.
 Stefan Hahn, Prof. D.Sc.
 Waldemar Kielek, D.Sc.,
 Jacek Jarkowski, Ph.D.

The research and teaching activities of the Radiocommunications Division are related to radiocommunication systems and networks, antennas, signal processing and measurement techniques. Research is focused on digital radio transmission and radio system design using advanced CAD methods, particularly cellular and short range systems, radio transmitting and receiving, as well as some

aspects of electromagnetic compatibility. Current research topics include:

- radiocommunication systems and networks – cellular networks (3G and beyond 3G), short range systems, ultra-wideband systems (UWB), methods and systems for radio positioning, systems for road safety, radio frequency identity devices (RFID), ad-hoc networks, satellite systems and broadband access networks,
- antennas and radio waves propagation – electrodynamic modeling and design of different types of microwave and mm-wave antennas, including electronically controlled beam steering and electronically reconfigurable antennas, as well as automatic near-field measurements of antennas characteristics and the modeling of propagation channel;
- radiocommunication measurements – spectrum monitoring methods and systems; automation of radiocommunication devices measurements;
- radio frequency power devices – high-efficiency resonant power amplifiers (class D, DE, E and G), linear wide-band short-wave amplifiers, high-power amplitude modulators, high-efficiency power supplies, 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;
- advanced numerical methods – circuits and systems design and optimization;
- environmental and biological problems – the influence of radio communication systems on a human health and environment as well as on electronic equipment, protection zones planning.

1.3.5 Television Division

Head of Division

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 Grzegorz Galiński, Ph.D., Assistant Professor
 Krystian Ignasiak, Ph.D., Assistant Professor
 Andrzej Miękina, Ph.D., Assistant Professor
 Grzegorz Pastuszak, Ph.D., Assistant Professor
 Andrzej Podgórski, Ph.D., Assistant Professor
 Marek Rusin, Ph.D., Assistant Professor (0.5)
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 Marcin Jędryka, M.Sc., from Feb. 2007
 Rafał Józwiak, M.Sc., from Oct. 2006
 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
 Michał Tomaszewski, M.Sc., from Mar. 2004

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 2008 included:

- video and audio compression;
- intelligent multimedia systems;
- networked audiovisual systems for immersive environments;
- 3D object modeling;
- 3D-TV;
- image processing, analysis and recognition;
- multimedia database indexing;
- object tracking and recognition;
- hardware architectures for video compression technologies;
- digital and interactive TV in the Internet.

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 teleradiology;
- computer-assisted diagnosis for mammography;
- brain imaging and computer assistance of diagnosis;
- ultrasound imaging systems;
- digital bronchoscopy system;
- medical information systems;
- image and universal compression;
- multiscale data 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 improv-

ing 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

Head

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Secretariat

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[Edu55];

[Pro20], [Pro36];

[MSc30];

[Bsc5];

[Pub15], [Pub16], [Pub41].

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[Edu83];

[Pro10], [Pro23], [Pro34];

[MSc4], [MSc40], [MSc44];

[Pub45], [Pub174], [Pub180].

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M.Sc. ('70), Ph.D. ('82); biomedical engineering; **Docent**, Nuclear and Medical Electronics Division.

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[Edu6], [Edu23], [Edu24], [Edu25], [Edu75], [Edu110]

[Edu111];

[Pro8], [Pro23];

[MSc15];

[BSc25];

[Pub71].

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M.Sc. ('88), Ph.D. ('97); television, digital signal and image processing, digital television systems; **Assistant Professor**, Television Division.

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[Edu22], [Edu115];

[Pro3], [Pro9], [Pro16];

[MSc7], [MSc75];

[BSc24];

[Pub46], [Pub82].

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[Edu76], [Edu123], [Edu127], [Edu144];

[Pro27];

[BSc2], [BSc43], [BSc46], [BSc48];

[Pub184], [Pub185], [Pub186], [Pub187], [Pub193].

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[Edu31], [Edu67], [Edu145];

[Pro22];

[Pub17], [Pub93], [Pub94], [Pub112], [Pub120], [Pub125],

[Pub157], [Pub158], [Pub163].

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[Edu13], [Edu88], [Edu115];

[Pro15], [Pro26];

[MSc13], [MSc65];

[BSc7], [BSc9], [BSc34], [BSc54], [BSc59].

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Member of the Faculty Council ('02-); Member of the Faculty Committee on Education ('08-); Head of the Area of Concentration Radiocommunications and Multimedia Technologies ('08-); Member of the Polish Society for Measurement, Automatic Control and Robotics POLSPAR ('92-); Team Award of the Rector ('08).

[Edu47], [Edu61], [Edu116], [Edu95a];

[Pro1], [Pro25];

[MSc33], [MSc47];

[Pub56].

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[Edu8], [Edu92], [Edu94], [Edu127];

[Pro27];

[MSc59];

[BSc16].

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[Edu8], [Edu32], [Edu92];

[Pro24];

[MSc60];

[Pub116], [Pub131], [Pub171].

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[Edu20], [Edu49];

[Pro4], [Pro5], [Pro23], [Pro41];

[MSc24], [MSc34], [MSc50], [MSc54], [MSc63], [MSc72],

[MSc77];

[BSc26], [BSc53];

[Pub85], [Pub86], [Pub87].

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[Edu38], [Edu106];

[Pro3], [Pro9], [Pro16], [Pro29], [Pro44];

[MSc41], [MSc49];

[BSc17], [BSc28], [BSc31];

[Pub23], [Pub168].

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M.Sc. ('96), Ph.D. ('01); microwave technique; **Assistant Professor**, Microwave and Radiolocation Engineering Division.

[Edu99];

[Pro6], [Pro7], [Pro14], [Pro22], [Pro40], [Pro45], [Pro46],

[Pro47];

[MSc10], [MSc22];

[BSc13], [BSc40], [BSc61];

[Pub48], [Pub52], [Pub110], [Pub118], [Pub119].

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M.Sc. ('70; '74 at MIT), Ph.D. ('77), D.Sc. ('88), Prof. Title ('00); electronics; Tenured Professor, Microwave and Radiolocation Engineering Division, Head ('06-). Fellow Member of IEEE ('00-); Distinguished Lecturer of IEEE ('03-'05), Member of the Faculty Committee on Education ('05-'08); Coordinator of the Teaching Area of Radiocommunications and Multimedia Technologies ('06-'08); Member of the Review Board of *IEEE Trans. on Microwave Theory and Techniques* ('88-), *IEEE Trans. on Antennas and Propagation* ('96-), *IEEE Microwave & Wireless Components Letters* ('96-); Member of the Technical Programme Committee of IEEE International Microwave Symp. ('99-'06) and International Microwave Conf. MIKON ('93-); Member of the Faculty Accreditation Board ('07-'08); Chair of the Faculty Awards Committee and Member of the University Awards Committee ('02-'05, '08-), Co-Chair of Technical Programme Committee of MIKON 2008 ('07-).

[Edu30], [Edu33], [Edu70], [Edu78];

[Pro22], [Pro46], [Pro47];

[MSc71];

[Pub17], [Pub18], [Pub23], [Pub39], [Pub40], [Pub93],

[Pub96], [Pub112], [Pub114], [Pub120], [Pub156],

[Pub157], [Pub158], [Pub159];

[Pat2].

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[Edu28], [Edu43], [Edu102], [Edu125];
[Pro3], [Pro16], [Pro29];
[MSc61];
[BSc3], [BSc42], [BSc44], [BSc56].

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[Edu15], [Edu36], [Edu105], [Edu120];
[Pro23], [Pro34];
[BSc4], [BSc22].

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[Edu60], [Edu75], [Edu101];
[Pro13], [Pro23], [Pro34];
[MSc3], [MSc21];
[BSc15];
[Pub51].

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M.Sc. ('86), Ph.D. ('98); radio frequency engineering, radio receivers, RF measurement techniques, shortwave propagation; **Assistant Professor**, Radiocommunications Division.

[Edu3], [Edu118];
[Pro15], [Pro26], [Pro27];
[MSc14], [MSc70];
[BSc52];
[Pub61].

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M.Sc. ('99), Ph.D. ('04); radiocommunications; **Assistant Professor**, Radiocommunications Division.

[Edu39], [Edu48];
[Pro15], [Pro24], [Pro38];
[MSc6], [MSc48], [MSc62], [MSc64], [MSc68];
[Pub46], [Pub189].

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[Edu18], [Edu61];
[Pro1], [Pro25];
[MSc25], [MSc36], [MSc37], [MSc43], [MSc73];
[Pub56], [Pub57], [Pub60].

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[Edu1], [Edu8], [Edu20];
[Pro4], [Pro5], [Pro23], [Pro41];
[MSc23];
[BSc20], [BSc30];
[Pub85], [Pub86], [Pub87].

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[Pro22], [Pro46];
[Pub23], [Pub94], [Pub125].

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[Edu10], [Edu46], [Edu96], [Edu113], [Edu114], [Edu121],
[Edu127], [Edu128], [Edu129], [Edu144];
[Pro1], [Pro27];
[MSc51], [MSc55], [MSc76];
[BSc39];
[Pub189].

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Group 6 Hearing Protectors of the Polish Committee for Standardization ('04-), Member of the Polish Acoustics Society ('73-); Member of the European Acoustics Society ('02-).
[Pro20], [Pro30];
[BSc21], [BSc33];
[Pub127], [Pub128].

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[Edu8].

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[Edu23], [Edu24], [Edu74], [Edu122], [Edu142], [Edu143];
[Pro20], [Pro43];
[MSc8], [MSc11], [MSc16], [MSc46];
[BSc14], [BSc27], [BSc51];
[Pub25], [Pub42], [Pub132].

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[Edu52], [Edu93], [Edu112];
[Pro2], [Pro6], [Pro15], [Pro24], [Pro32], [Pro38];
[MSc57];
[Pub129], [Pub130], [Pub164], [Pub165].

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[Edu56], [Edu89], [Edu109];
[Pro4], [Pro5], [Pro23], [Pro41], [Pro42];
[Pub45].

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[Edu4], [Edu134], [Edu142], [Edu143];
[Pro20];
[BSc23], [BSc45].

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[Edu77];
[Pro21], [Pro36];
[BSc38];
[Pub27], [Pub41].

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[Edu17], [Edu85];
[Pro4], [Pro5], [Pro23], [Pro42];
[Pub12], [Pub85], [Pub86], [Pub87].

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Tutorial assistance of Innovative Information Technologies Student Scientific Group ('05-).

[Edu19], [Edu80];
[Pro22];
[Pub64], [Pub139].

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[Pro25].

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[Edu34], [Edu41], [Edu107];
[Pro12], [Pro28];
[BSc35], [BSc36], [BSc63];

[Pub34].

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[Edu27];

[Pro26];

[BSc11], [BSc55], [BSc57];

[Pub68], [Pub143].

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[Edu23], [Edu24], [Edu146];

[Pro1], [Pro2], [Pro6], [Pro24], [Pro38];

[PhD2];

[BSc37];

[Pub32], [Pub33], [Pub46], [Pub47], [Pub50], [Pub58], [Pub65], [Pub91], [Pub97], [Pub98], [Pub99], [Pub100], [Pub101], [Pub102], [Pub106], [Pub109], [Pub111], [Pub129], [Pub130], [Pub141], [Pub164], [Pub165], [Pub171], [Pub172], [Pub173], [Pub188], [Pub189].

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[Edu3], [Edu27], [Edu51], [Edu118];

[Pro15], [Pro26];

[MSc31];

[BSc58];

[Pub66], [Pub67], [Pub68], [Pub142], [Pub143].

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M.Sc. ('72), Ph.D. ('79), D.Sc. ('90), Prof. Title ('01); measurement and instrumentation; **Professor**, Television Division.

Member of the Committee for Metrology and Scientific Instrumentation, Polish Academy of Sciences ('93-'96, '99-); POLSPAR Representative in the IMEKO General Council of International Measurement Confederation IMEKO ('98-); Member of the IMEKO Advisory Board ('06-); Fellow Member of ITE ('94-); Senior Member of IEEE ('99-); Member of the Editorial Board of *Measurement – Journal of IMEKO* ('97-); Chairman of the International Programme Committee of *Metrology and Measurement Systems* ('07-); Reviewer of *IEEE Transactions on Instrumentation and Measurement* ('89-) and of *IET Science, Measurement and Technology* ('07-); Member of the Steering Committee of the project "Benchmarking in Higher Education", Polish Rectors Foundation ('07-); Member of the Business School Council, Warsaw University of Technology ('96-'02, '05-'08); Member of the Selection Committee for Young Scientist Medal, Warsaw University of Technology ('07-); Chairman of the Faculty Council Committee on History and Tradition ('08-), Chairman of the Dean's Board of English-medium Studies ('08-), Member of the Senate Committee on History and Tradition ('08-).

[Edu29], [Edu34], [Edu41], [Edu79];

[Pro12], [Pro28];

[Pub26], [Pub34], [Pub35], [Pub103], [Pub104], [Pub133],

[Pub144], [Pub190], [Pub191].

Tadeusz Morawski

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M.Sc. (electronics '63), M.Sc. (mathematics '66), Ph.D. ('70), D.Sc. ('73), Prof. Title ('80); microwave technique; **Tenured Professor**, Microwave and Radiolocation Engineering Division.

Member of the Technical Program Committee of MIKON ('80-); Member of the Faculty Council Committee on Academic Staff Development ('05-); Member of the Committee on Electronics and Telecommunications KEiT, Polish Academy of Sciences PAN ('90-); Member of the Microwave Section of KEiT ('96-); Senior Member of IEEE ('80-).

[Edu25], [Edu30], [Edu100];

[Pro14], [Pro22];

[Pub48], [Pub110].

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e-mail: K.Mroczek@ire.pw.edu.pl

M.Sc. ('95), Ph.D. ('02); measurement and instrumentation, programmable logic devices, System-on-a-Programmable-Chip (SoPC); **Assistant Professor**, Electroacoustics Division.

[Edu7], [Edu26];

[Pro21];

[MSc26].

Tomasz Olszewski

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M.Sc. ('82); nuclear and medical electronics, capacitance tomography, digital electronics, programmable logic devices; **Senior Lecturer**, Nuclear and Medical Electronics Division; Member of the Technical Committee for Standardisation TC 302 – Using Informatics in the Health Protection ('07-); Team Award of the Rector ('08).
[Edu7], [Edu20], [Edu26], [Edu36], [Edu108];
[Pro23], [Pro33];
[Pub30], [Pub71].

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M.Sc. ('01), Ph.D. ('06); integrated circuit design, multimedia systems, video processing; **Assistant Professor**, Television Division.
[Pro9], [Pro29];
[Pub36], [Pub53], [Pub74], [Pub121], [Pub122], [Pub147], [Pub148], [Pub149].

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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'); Team Award of the Rector ('08).
[Edu36], [Edu75];
[Pro10], [Pro23], [Pro31], [Pro34], [Pro37], [Pro48];
[MSc12], [MSc32];
[Pub45], [Pub55], [Pub152], [Pub169], [Pub176], [Pub177], [Pub180].

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M.Sc. ('75), Ph.D. ('83); measurement and instrumentation; **Assistant Professor**, Television Division.
[Edu9], [Edu34], [Edu41];
[Pro12], [Pro28].

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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-).
[Edu14], [Edu69], [Edu73];
[Pro13], [Pro23], [Pro35];
[PhD1], [PhD4];
[MSc29], [MSc45], [MSc53];
[BSc6], [BSc8];

[Pub3], [Pub4], [Pub5], [Pub6], [Pub7], [Pub20], [Pub21], [Pub37], [Pub38], [Pub51], [Pub75], [Pub76], [Pub77], [Pub81], [Pub150], [Pub181], [Pub182].

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M.Sc. ('70), Ph.D. ('78); radio-frequency engineering and measurement; **Assistant Professor**, Radiocommunication 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-).
[Edu58], [Edu103], [Edu117], [Edu127];
[Pro25];
[MSc67];
[BSc59a], [BSc60];
[Pub78].

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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-).
[Pro11], [Pro23], [Pro35];
[MSc52];
[Pub7], [Pub8], [Pub13], [Pub29], [Pub30], [Pub71], [Pub79], [Pub80], [Pub81], [Pub153], [Pub154], [Pub161], [Pub162], [Pub192].

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[Edu91];
[Pro22].

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[Edu11], [Edu63];
[Pro22];
[MSc18];
[Pub9].

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[Edu53].

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[Edu62], [Edu65], [Edu82], [Edu84];
[Pro3], [Pro9], [Pro13], [Pro29], [Pro39], [Pro44];
[MSc5];
[BSc10], [BSc50];
[Pub22], [Pub46], [Pub54], [Pub59], [Pub69], [Pub70], [Pub82], [Pub83], [Pub124], [Pub160].

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[Edu42], [Edu45], [Edu68], [Edu104];
[Pro8], [Pro11], [Pro23], [Pro33];
[MSc39], [MSc66];
[BSc18], [BSc62];
[Pub30], [Pub71], [Pub161], [Pub162].

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M.Sc. ('91), Ph.D. ('02); signal and system theory and applications; **Assistant Professor**, Radiocommunications Division. Faculty Coordinator of M.Sc. Evening Studies on Radiocommunications ('05-).
[Edu54], [Edu58], [Edu117];
[Pro27];
[BSc41];
[Pub84].

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[Edu44];
[Pro22];
[Pub113].

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[Edu36], [Edu86];
[Pro8], [Pro23], [Pro33];
[MSc38], [MSc42];
[BSc12], [BSc49];
[Pub30], [Pub71]

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[Edu57], [Edu87], [Edu143], [Edu144];
[Pro20];
[MSc69], [MSc74];
[BSc1], [BSc29].

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M.Sc. ('98), Ph.D. ('02); radio networks, heuristics methods, radiocommunications; **Assistant Professor**, Radiocommunications Division.
[Edu71], [Edu72];
[Pro1], [Pro27];
[Pub1], [Pub2].

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[Edu44].

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and Programme Committee of the National Conferences: SP ('01-), KM ('06-), PD ('06-), MWK ('08-), and International Conference IEEE IDAACS ('01-); Reviewer of the *IEEE Transactions on Instrumentation and Measurement* ('03-); Member of the Editorial Board of the *International Journal of Computing* ('06-); Guest Editor of the Special Issue on Virtual Instrumentation and Virtual Laboratories of the *International Journal of Computing* ('08); Member of Programme Board of the journal *Pomiary Automatyka Kontrola* ('07-).

[Edu35], [Edu55], [Edu77], [Edu95];

[Pro21], [Pro30], [Pro36];

[MSc9];

[Pub11], [Pub14], [Pub16], [Pub27], [Pub41], [Pub73],

[Pub92], [Pub95], [Pub167], [Pub195].

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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], [Edu54], [Edu72], [Edu81], [Edu122];

[Pro27];

[PhD3];

[Pub1], [Pub2], [Pub10].

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[Edu37], [Edu119];

[Pro6], [Pro7], [Pro14], [Pro22], [Pro40], [Pro45], [Pro46],

[Pro47];

[BSc19];

[MSc1], [MSc20], [MSc56], [MSc58];

[Pub52], [Pub118], [Pub119], [Pub155].

Yevhen Yashchysyn

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

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 the Microwave and Radiolocation Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('07-).

[Edu2], [Edu64];

[Pro2], [Pro6], [Pro24], [Pro38];

[MSc17];

[Pub44], [Pub47], [Pub49], [Pub58], [Pub106], [Pub111],

[Pub141], [Pub170], [Pub171], [Pub172], [Pub173],

[Pub175],

[Pub194];

[Pat1].

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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

Council Committee on Faculty Organization ('05-'08);

Member of the Faculty Accreditation Board ('07-); Member

of the University Council Committee on Property and Fin-

ances ('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 Bio-

medical 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 Scientific

Committee of the International Conference NTAV/SPA

2008; Member of the Editorial Advisory Board of the *Pol-*

ish Journal of Medical Physics and Engineering ('07-),

Head of the Area of Concentration Electronics and Inform-

ation Technology in Medicine ('06-); Deputy Chairman of

the Board of the Center for Imaging and Biomedical

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-); Fac-

ulty Coordinator of Faculty Development ('08-); Faculty

Coordinator of Area of Studies Biomedical Engineering

('08-).

[Edu50], [Edu66];

[Pro4], [Pro5], [Pro17], [Pro18], [Pro23], [Pro41], [Pro42];

[MSc2], [MSc19], [MSc27];

[BSc32];

[Pub12], [Pub85], [Pub86], [Pub87], [Pub88], [Pub89].

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

[Edu37];

[Pro22];

[Pub48], [Pub110].

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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-).

[Edu5], [Edu40];

[Pro19], [Pro20];

[BSc47].

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Maciej Bielecki, M.Sc.*	(K. Zaremba)
Kamil Bryłka, M.Sc.*	(Y. Yashchyshyn)
Marek Bury, M.Sc.	(J. Modelski)
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)
Andrzej Dominik, M.Sc.	(J. Wojciechowski)
Emil Dmoch, M.Sc.*	(W. Skarbek)
Michał Dziewiecki, M.Sc.	(J. Marzec)
Michał Grabowski, M.Sc.	(S. Rostłonec)
Mariusz Jakubowski, M.Sc.*	(W. Skarbek)
Cezary Jezierski, M.Sc.*	(J. Modelski)
Marcin Jędryka, M.Sc.*	(W. Skarbek)
Rafał Józwiak, M.Sc.	(A. Przelaskowski)
Rafał Korycki, M.Sc.*	(Z. Kulka)
Sebastian Kozłowski, M.Sc.	(T. Morawski)
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)
Aleksandra Młyńska, M.Sc.	(Z. Kulka)
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)
Wojciech Padée, M.Sc.	(K. Zaremba)

Andrzej Piętak, M.Sc.	(J. Wojciechowski)
Lech Raczyński, M.Sc.	(K. Zaremba)
Dawid Rosołowski, M.Sc.	(T. Morawski)
Tymon Rubel, M.Sc.*	(K. Zaremba)
Bartłomiej Salski, M.Sc.	(W. Gwarek)
Andrzej Smolnik, M.Sc.*	(K. Zaremba)
Michał Sołtysiak, M.Sc.	(W. Gwarek)
Marcin Stolarski, M.Sc.*	(W. Winiecki)
Aneta Świercz, M.Sc.*	(J. Żera)
Michał Tomaszewski, M.Sc.*	(W. Skarbek)
Krzysztof Woźniak, M.Sc.*	(K. Zaremba)
Marcin Ziembicki, M.Sc.	(J. Marzec)
Paweł Ziętek, M.Sc.*	(J. Modelski)
Michał Żebrowski, M.Sc.	(S. Rostłonec)

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3 TEACHING ACTIVITIES (academic year 2007/2008)

3.1 Regular studies – Areas of Focus:

Radiocommunications and Multimedia Technologies

Head

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Electronics and Information Technology in Medicine

Head

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3.1.1 Basic Courses

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| <p>[Edu1] <i>Analysis of Measurement Data in Medicine</i> (Analiza danych pomiarowych w medycynie – ADP); 45h/sem.; B. Konarzewski.</p> <p>[Edu2] <i>Antennae and Radio-wave Propagation</i> (Anteny i propagacja fal – AIPF); 45h/sem.; Y. Yashchynshyn.</p> <p>[Edu3] <i>Basic Radio-frequency Circuits</i> (Podstawowe układy radioelektroniczne – PURAD); 45h/sem.; J. Modzelewski, W. Kazubski.</p> <p>[Edu4] <i>Basics of Electroacoustics</i> (Podstawy elektroakustyki – PEL); 45h/sem.; A. Leszczyński.</p> <p>[Edu5] <i>Basics of Hearing and Sound Perception</i> (Podstawy słyszenia i percepcja dźwięku – PSPD); 30h/sem.; J. Żera.</p> <p>[Edu6] <i>Basics of Medical Imaging Techniques</i> (Podstawy technik obrazowania w medycynie – PTOM); 60h/sem.; P. Brzeski.</p> <p>[Edu7] <i>Basics of Microelectronics – Lab.</i> (Podstawy mikroelektroniki – PMK); 30h/sem.; T. Olszewski, K. Mroczek.</p> <p>[Edu8] <i>Basics of Microprocessor Technique</i> (Podstawy techniki mikroprocesorowej – TMIK); 60h/sem.; K. Czerwiński, B. Konarzewski, K. Derzakowski, T. Krzymień.</p> <p>[Edu9] <i>Basics of Programming</i> (Podstawy programowania – PRM); 60h/sem.; A. Podgórski.</p> <p>[Edu10] <i>Basics of Radiocommunications</i> (Podstawy radiokomunikacji – PR); 30h/sem.; T. Kosiło.</p> <p>[Edu11] <i>Basics of Radiolocation and Radionavigation</i> (Podstawy radiolokacji i radionawigacji – PRIR); 45h/sem.; S. Rosłonec.</p> <p>[Edu12] <i>Basics of Television</i> (Podstawy telewizji – POTE); 45h/sem.; M. Rusin.</p> | <p>[Edu13] <i>Broadcasting Systems</i> (Systemy radiofoniczne – SYR); 45h/sem.; H. Chaciński.</p> <p>[Edu14] <i>Computer Graphics</i> (Grafika komputerowa – GRK); 30h/sem.; A. Przelaskowski.</p> <p>[Edu15] <i>Computer Systems</i> (Systemy komputerowe – SYKO); 45h/sem.; T. Jamróiewicz.</p> <p>[Edu16] <i>Construction of High Quality Audio Equipment</i> (Konstrukcja urządzeń audio wysokiej jakości – KUA); 30h/sem.; P. Nykiel.</p> <p>[Edu17] <i>Detection of Nuclear and Biomedical Signals</i> (Detekcja sygnałów biomedycznych i jądrowych – DSBJ); 60h/sem.; J. Marzec.</p> <p>[Edu18] <i>Digital Cellular Systems</i> (Cyfrowe systemy komórkowe – CSK); 45h/sem.; J. Kołakowski.</p> <p>[Edu19] <i>Digital Circuits – EDC1</i>; 30h/sem.; elective; P. Miazga (English-medium studies).</p> <p>[Edu20] <i>Digital Circuits – Lab.</i> (Układy logiczne; laboratorium – ULOGE); 30h/sem.; G. Domański, B. Konarzewski, T. Olszewski.</p> <p>[Edu21] <i>Digital Communications – EDICO</i>; 60h/sem.; J. Wojciechowski (English-medium studies).</p> <p>[Edu22] <i>Digital and Interactive Television</i> (Telewizja cyfrowa i interaktywna – TCI); 60h/sem.; elective; A. Buchowicz.</p> <p>[Edu23] <i>Diploma Seminar for Graduate Students 1</i> (Seminarium dyplomowe magisterskie 1 – SDM1); 30h/sem.; J. Modelski, P. Brzeski, Z. Kulka.</p> <p>[Edu24] <i>Diploma Seminar for Graduate Students 1</i> (Seminarium dyplomowe magisterskie 1 – SDM2); 30h/sem.; Z. Kulka, J. Modelski, P. Brzeski.</p> <p>[Edu25] <i>Diploma Seminar for Undergraduate Students</i> (Seminarium dyplomowe inżynierskie – SDI); 30h/sem.; P. Brzeski, T. Morawski.</p> <p>[Edu26] <i>Digital Systems</i> (Układy cyfrowe – UCYF); 15h/sem.; K. Mroczek, T. Olszewski.</p> <p>[Edu27] <i>Electronic Circuits Supply</i> (Zasilanie układów elektronicznych – ZUE); M. Mikołajewski, J. Modzelewski.</p> <p>[Edu28] <i>Event-Driven Programming</i> (Programowanie zdarzeniowe – PZDT); 45h/sem.; K. Ignasiak.</p> <p>[Edu29] <i>Ethical Aspects of Research and Engineering – EEARE</i>; 30h/sem.; R. Z. Morawski (English-medium studies).</p> <p>[Edu30] <i>Fields and Waves</i> (Pola i fale – POFAT); 45h/sem.; T. Morawski, W. Gwarek.</p> <p>[Edu31] <i>Fields, Waves and Antennae – EFWA</i>; 60h/sem.; elective; M. Celuch (English-medium studies).</p> <p>[Edu32] <i>Influence of Electromagnetic Waves on Living Organisms</i> (Oddziaływanie fal elektromagnetycznych na organizmy żywe – OFE); 30h/sem.; K. Derzakowski.</p> |
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- [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] *Numerical Methods* – ENUME; 60h/sem.; R. Z. Morawski, A. Miękina, A. Podgórski (English-medium studies).
- [Edu42] *Object-oriented Programming M* (Programowanie obiektowe M – PROBI); 60h/sem.; W. Smolik.
- [Edu43] *Object-oriented Programming of Multimedia Applications in Java* (Java – obiektowe programowanie aplikacji multimedialnych – OPA); 45h/sem.; K. Ignasiak.
- [Edu44] *Operating Systems* (Systemy operacyjne – SOE); 15h/sem.; M. Sypniewski, A. Więckowski.
- [Edu45] *Programming Languages* (Języki programowania – JPJ); 75h/sem.; W. Smolik.
- [Edu46] *Radiocommunication Systems* (Systemy radiokomunikacyjne – SRKO); 45h/sem.; T. Kosiło.
- [Edu47] *Radioelectronics Measurements* (Miernictwo radioelektroniczne – MR); 45h/sem.; J. Cichocki.
- [Edu48] *Radio Networks and Systems* (Systemy i sieci radiowe – SISR); 45h/sem.; T. Keller.
- [Edu49] *Radiological Apparatus in Medical Diagnostics* (Aparatura radiologiczna w diagnostyce medycznej – ARDM); 30h/sem.; G. Domański.
- [Edu50] *Radiology and Nucleonics* (Radiologia z nukleoniką – RN); 45h/sem.; K. Zaremba.
- [Edu51] *Radio Transmitting Technique and its Applications* (Technika nadawania radiowego i jej aplikacje – TNR); 60h/sem.; J. Modzelewski.
- [Edu52] *Satellite Communications* (Łączność satelitarna – ŁS); 45h/sem.; K. Kurek.
- [Edu53] *Selected Problems of Modern Television* (Wybrane zagadnienia współczesnej telewizji – WZWT); 30h/sem.; M. Rusin.
- [Edu54] *Signals and Systems* (Sygnały i Systemy – SYST); 60h/sem.; J. Wojciechowski, K. Snopek.
- [Edu55] *Software for Measuring Systems* (Oprogramowanie systemów pomiarowych – OSP); 60h/sem.; W. Winiecki, P. Bobiński.
- [Edu56] *Software for Medical Systems* (Oprogramowanie systemów medycznych – OSM); 45h/sem.; R. Kurjata.
- [Edu57] *Recording and Forming of Sound* (Odbiór i kształtowanie dźwięku – OKD); 45h/sem.; M. Tajchert.
- [Edu58] *Signals and Modulations* (Sygnały i modulacje – SYGM); 45h/sem.; K. Snopek, K. Radecki.
- [Edu59] *Study Audio Techniques – Lab.* (Dźwiękowa technika studyjna – DTS); 15h/sem.; R. Korycki.
- [Edu60] *Ultrasonography Instrumentation* (Aparatura ultrasonograficzna – AUS); 45h/sem.; M. Kazubek.
- [Edu61] *UMTS System* (System UMTS – UMTS); 45h/sem.; J. Kołakowski, J. Cichocki.

3.1.2 Advanced courses

- [Edu62] *Adaptive Image Recognition* – EADIR; 60h/sem.; W. Skarbek (English -medium studies).
- [Edu63] *Analysis and Synthesis of Microwave Circuits* (Analiza i synteza układów mikrofalowych – ASUM); 45h/sem.; S. Rosłonec.
- [Edu64] *Antennae Theory and Design* (Teoria i projektowanie anten – TPA); 60h/sem.; Y. Yashchysyn.
- [Edu65] *Applied Geometry* (Geometria stosowana – GS); 60h/sem.; W. Skarbek.
- [Edu66] *Artificial Neural Networks in Medicine* (Sztuczne sieci neuronowe w medycynie – SESN); 45h/sem.; K. Zaremba.
- [Edu67] *Computational Electromagnetics for Telecommunication* – ECOET; 60h/sem.; M. Celuch (English-medium studies).
- [Edu68] *Computed Tomography* (Tomografia komputerowa – TOM); 60h/sem.; W. Smolik.
- [Edu69] *Computer Aided Medical Image Diagnostics* (Komputerowe wspomaganie obrazowej diagnostyki medycznej – KWOD); 45h/sem.; A. Przelaskowski.
- [Edu70] *Computer Analysis of Electrodynamics Problems* (Komputerowa analiza problemów elektrodynamiki – KAPE); 45h/sem.; W. Gwarek.
- [Edu71] *Contemporary Heuristic Techniques* – ECOHT; 60h/sem.; Z. Walczak (English-medium studies).
- [Edu72] *Contemporary Heuristic Techniques* (Współczesne techniki heurystyczne – WMH); 60h/sem.; Z. Walczak, J. Wojciechowski.

- [Edu73] *Data Compression* (Kompresja danych – KODA); 45h/sem.; A. Przelaskowski.
- [Edu74] *Digital Audio Signal Processing* (Cyfrowe przetwarzanie sygnałów fonicznych – CPSF); 45h/sem.; Z. Kulka.
- [Edu75] *Digital Image Processing* (Cyfrowe przetwarzanie obrazów – CPOO); 30h/sem.; M. Kazubek, P. Brzeski, E. Piątkowska-Janko.
- [Edu76] *Digital Transmission of Information* (Cyfrowa transmisja informacji – CTIN); 45h/sem.; T. Buczkowski.
- [Edu77] *Distributed Measurement Systems* (Rozproszone systemy pomiarowo-kontrolne – RSPK); 45h/sem.; W. Winiecki, R. Łukaszewski.
- [Edu78] *Electromagnetic Compatibility* (Kompatybilność elektromagnetyczna – KE); 30h/sem.; W. Gwarek.
- [Edu79] *Ethical Aspects of Research in Technology* (Etyczne aspekty działalności badawczej w technice – S13); 15h/sem.; R. Z. Morawski.
- [Edu80] *Evolutionary Algorithms* – EEVAL; 60h/sem.; P. Miazga (English-medium studies).
- [Edu81] *Graphs and Networks* (Grafy i sieci – GIS); 30h/sem.; elective; J. Wojciechowski.
- [Edu82] *Image and Audio Semantic Analysis* (Analiza semantyczna obrazu i dźwięku – ASOD); 45h/sem.; W. Skarbek.
- [Edu83] *Magnetic Resonance Imaging* (Tomografia rezonansu magnetycznego – TRM); 45h/sem.; P. Bogorodzki.
- [Edu84] *Multimedia Indexing* (Indeksowanie multimediów – INM); 60h/sem.; W. Skarbek.
- [Edu85] *Noise and Electromagnetic Interference in Electronics Devices* (Szumy i zakłócenia w aparaturze elektronicznej – SZAE); 30h/sem.; J. Marzec.
- [Edu86] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej – TMN); 60h/sem.; R. Szabatin.
- [Edu91] *Basics of High-Frequency Techniques* (Podstawy techniki w.cz. – PTWM); 60h/sem.; semester 3; K. Robaczyński.
- [Edu92] *Basics of Logical Circuits and Microprocessor Technique* (Układy logiczne i podstawy techniki mikroprocesorowej – PULM); 60h/sem.; semester 4; K. Czerwiński, K. Derzakowski.
- [Edu93] *Basics of Satellite Communications* (Podstawy łączności satelitarnej – SATM); 15h/sem.; semester 4; K. Kurek.
- [Edu94] *Circuits and Signals* (Obwody i sygnały – OSRM); 45h/sem.; semester 2; K. Czerwiński.
- [Edu95] *Computer Control and Data Processing* (Komputerowe sterowanie i przetwarzanie danych – KSTM); 45h/sem.; semester 5; W. Winiecki.
- [Edu95a] *Digital Cellular Systems* (Cyfrowe systemy komórkowe – CSKM); 36h/sem.; J. Cichocki.
- [Edu96] *Digital Signals Transmission* (Cyfrowa transmisja sygnałów – CTSM); 45h/sem.; semester 5; T. Kosiło.
- [Edu97] *Diploma Seminar* (Seminarium dyplomowe – SDM); 15h/sem.; semester 6; J. Ebert.
- [Edu98] *Diploma Seminar 2* (Seminarium dyplomowe 2 – SD2M); 15h/sem.; semester 7; J. Ebert.
- [Edu99] *Electronic Circuits* (Układy elektroniczne – UEM); 45h/sem.; semester 3; D. Gryglewski.
- [Edu100] *Fields and Waves* (Pola i fale – PFM); 60h/sem.; semester 2; T. Morawski.
- [Edu101] *Imaging Techniques* (Techniki obrazowe – TORM); 30h/sem.; semester 7; M. Kazubek.
- [Edu102] *Internet Techniques* (Techniki internetowe – TINM); 30h/sem.; semester 7; K. Ignasiak.
- [Edu103] *Materials and Elements* (Materiały i elementy – MEM); 15h/sem.; semester 4; K. Radecki.
- [Edu104] *Multimedia Applications* (Aplikacje multimedialne – AMRM); 15h/sem.; semester 5; W. Smolik.
- [Edu105] *Multimedia Computer Systems* (Multimedialne systemy komputerowe – MSKM); 30h/sem.; semester 4; T. Jamrógiewicz.
- [Edu106] *Multimedia Techniques* (Techniki multimedialne – TMM); 15h/sem.; semester 6; G. Galiński.
- [Edu107] *Numerical Methods* (Metody numeryczne – MNRM); 30h/sem.; semester 3; A. Miękina.
- [Edu108] *Programmable Digital Devices* (Programowalne układy cyfrowe – PUCM); 30h/sem.; semester 5; T. Olszewski.
- [Edu109] *Programming* (Programowanie – PMRM); 30h/sem.; semester 3; R. Kurjata.
- [Edu110] *Project 1* (Projekt 1 – PJUM); 30h/sem.; semester 5; P. Brzeski.
- [Edu111] *Project 2* (Projekt 2 – PSRM); 60h/sem.; semester 6; P. Brzeski.
- [Edu112] *Propagation of Waves* (Propagacja fal – PFAM); 15h/sem.; semester 4; K. Kurek.

3.2 Special courses

3.2.1 Engineer Degree Evening Studies on Radiocommunications and Multimedia Technologies

- [Edu87] *Acoustic Techniques* (Techniki dźwiękowe – TDRM); 30h/sem.; semester 7; M. Tajchert.
- [Edu88] *Antennae* (Anteny – ANM); 30h/sem.; semester 4; H. Chaciński.
- [Edu89] *Basics of Computer Techniques* (Podstawy techniki komputerowej – PKOM); 45h/sem.; semester 1; R. Kurjata.
- [Edu90] *Basics of Fiberglass Technique* (Podstawy techniki światłowodowej – PTSRM); 45h/sem.; semester 3; L. Lewandowski.

- [Edu113] *Radiocommunication Systems 1* (Systemy radiokomunikacyjne 1 – SRKM); 60h/sem.; semester 6; T. Kosiło.
- [Edu114] *Radiocommunication Systems 2* (Systemy radiokomunikacyjne 2 – SRK2M); 30h/sem.; semester 7; T. Kosiło.
- [Edu115] *Radiodiffusion Systems* (Systemy radiodiffuzyjne – SRDM); 60h/sem.; semester 6; A. Buchowicz, H. Chaciński.
- [Edu116] *Radioelectronics Measurements* (Miernictwo radioelektroniczne – MRM); 45h/sem.; semester 5; J. Cichocki.
- [Edu117] *Signals and Modulations* (Sygnały i modulacje – SMRM); 60h/sem.; semester 3; K. Snopek, K. Radecki.
- [Edu118] *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

- [Edu119] *Analysis and Synthesis of Microwave Units* (Analiza i synteza układów mikrofalowych – ASUMW); 60h/sem.; semester 2; W. Wojtasiak.
- [Edu120] *Computer Systems* (Systemy komputerowe – SMKW); 30h/sem.; semester 2; T. Jamró-giewicz.
- [Edu121] *Designing of Radiocommunication Systems* (Projektowanie systemów radiokomunikacyjnych – PSRW); 60h/sem.; semester 3; T. Kosiło.
- [Edu122] *Digital Signals Processing* (Cyfrowe przetwarzanie sygnałów – CPSW); 75h/sem.; semester 1; J. Wojciechowski, Z. Kulka.
- [Edu123] *Digital Transmission of Information* (Cyfrowa transmisja informacji – CTIW); 75h/sem.; semester 2; T. Buczkowski.
- [Edu124] *Diploma Seminar* (Seminarium dyplomowe – SDMW); 30h/sem.; semester 4; J. Ebert.
- [Edu125] *Numerical Methods* (Metody numeryczne – MNW); 30h/sem.; semester 2; K. Snopek.
- [Edu126] *Programming in Java Language* (Programowanie w języku Java – PJJW); 45h/sem.; semester 1; K. Ignasiak.
- [Edu127] *Radio Navigation Systems* (Radiowe systemy nawigacyjne – RSNW); 45h/sem.; semester 4; T. Buczkowski, K. Czerwiński, K. Radecki.
- [Edu128] *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”

- [Edu129] *Development of Systems and Telecommunication Networks/Legal Aspects* (Rozwój systemów i sieci telekomunikacyjnych / Aspekty prawne); 10h, once a year, S. Kula, T. Kosiło, C. Woźniak.
- [Edu130] *Radio Links Design* (Projektowanie linii radiowych) 36h, twice a year, T. Kosiło, K. Płatek.

3.2.4 Studies on Audiological Techniques

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

- [Edu131] *Anatomy and Physiology of Hearing* (Anatomia i fizjologia słyszenia); 12h.
- [Edu132] *Audiometry* (Audiometria); 30h.
- [Edu133] *Aural Rehabilitation* (Rehabilitacja); 7h.
- [Edu134] *Basics of Acoustics* (Podstawy akustyki); 16h.
- [Edu135] *Earmold Technics* (Wkładki douszne); 8h.
- [Edu136] *Ear Pathology* (Patologia ucha); 9h.
- [Edu137] *Elements of Psychology* (Elementy psychologii); 6h.
- [Edu138] *SignLanguages and Cued Speech* (Język gestów); 8h.
- [Edu139] *Hearing Aid Fitting* (Dobór aparatów słuchowych); 40h.
- [Edu140] *Hearing Aid Measurements* (Miernictwo aparatów słuchowych); 14h.
- [Edu141] *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)

- [Edu142] *Basics of Sound Technique* (Podstawy techniki dźwiękowej); 30h/sem.; Z. Kulka, A. Leszczyński, M. Tajchert.
- [Edu143] *Systems and Devices of Sound Technique* (Urządzenia i systemy techniki dźwiękowej); 30h/sem.; Z. Kulka, A. Leszczyński, M. Tajchert.

3.3 International co-operation

- [Edu144] **SOCRATES Program: Higher Education**
T. Kosiło, T. Buczkowski
1999 – 2008

SOCRATES Program: Higher Education: T. Kosiło, T. Buczkowski 1999 – 2008 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 frame-

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work of Electronics and Telecommunication Engineering (Socrates code 06.05). The aim of the program is to realize a student project at the partner University. This year two students from KaHo (Vincent Koole and Jan Van Moer) had 6 months project at our Institute.

[Edu145] **Małgorzata Celuch** gave a lecture within the frame of an advanced course "*Intro to Computational Electromagnetics and High-Frequency Circuit Modeling*", Worcester Polytechnic Institute (USA).

[Edu146] **Józef Modelski** gave series of invited lectures: "*Trends in Satellite Communications*", Amman (Jordanian), "*New Antennas: Smart/Reconfigurable/Ferroelectric*" Hyderabad, Bangalore, Jajpur, New Delhi, Kalkuta (India).

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 is 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 an 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 manoeuvres.

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

The aim of RESOLUTION is 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 modelling of the indoor multipath propagation channel and design of smart antenna arrays for the system.

- [Pro3] **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

- [Pro4] **The COMPASS Experiment – the Research on the Spin Structure of Nucleon** (Eksperyment COMPASS – badanie spinowej struktury nukleonu).

Krzysztof Zaremba, J. Marzec, M. Dziewiecki,
 G. Domański, B. Konarzewski, R. Kurjata, 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 2008-2012.

- [Pro5] **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 shoot 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

- [Pro6] **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. 9, 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.

- [Pro7] **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 as follows:

- high-temperature AC-DC and DC-DC converters with efficiency more than 85%,
- high power microwave amplifiers of up to 100W 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.

- [Pro8] **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. Płaskowski, 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

- [Pro9] **Algorithms for Adaptive Video Transcoding and their Hardware Implementation** (Algorytmy adaptacyjnego transkodowania cyfrowego sygnału wizyjnego i ich implementacja sprzętowa).

Andrzej Buchowicz, W. Skarbek, G. Pastuszek, G. Galiński, K. Wnukowicz, S. Badura;
Jun. 4, 2006 – Jun. 4, 2008

The overall purpose of the project is to develop an effective adaptive video transcoding algorithms for bit rate reduction, spatial and temporal resolution down-sampling and transcoding between video coding standards. Special attention will be paid to the transcoding from the MPEG-2 standard to the H.264 standard. The selected algorithms will be implemented in hardware allowing real time processing.

- [Pro10] **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 build 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 paresis patients.

- [Pro11] **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 is 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.

- [Pro12] **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.

[Pro13] Acute Ischemic Stroke Detection based on Non-Contrast CT Examinations: Computer-based Methods of Hypodensity 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 – Sept. 30, 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.

The purpose of our study is to improve the diagnosis of hyperacute ischemic brain parenchyma on emergency CT scans. The method is the enhanced visibility of more distinguished or extracted subtle and hidden hypodense signs. Multi-scale hypodensity modeling was based on the following data processing stages: the initial gray-to-white tissue segmentation; the next segmentation of potentially hypodense areas (e.g. sulci or the aged lesions); noise suppression in selected ROIs through the non-perfect signal reconstruction in successive scales, basing on middle band noise suppressing, adaptive signal modeling and extraction. Local contrast of the processed images was additionally improved by adaptive data visualization methods. Realized concept of Stroke Monitor is a display of ischemic stroke as a kind of computer aided interpretation tool. Signal and noise separation based on spatially distributed properties over different scales and sub-bands is

optimized. Lower frequency parts offer distinguished information about poor textures and mean value estimates in regions. A correlation of high frequency information across scales, portrays even very weak edges and region distinction. Therefore, noise and artifacts may effectively be reduced in multi-scale data processing. Post-processing in multi-scale domain (wavelets, curvelets) is less susceptible to local perturbations, and beneficial noise suppression and selective contrast enhancement is possible.

[Pro14] 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 consist 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.

[Pro15] 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.

- [Pro16] **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

- [Pro17] **Applications of the Neural Networks in Classification Tasks in the High Energy Physics Experiments** (Sztuczne sieci neuronowe w zadaniach klasyfikacji w eksperymentach fizyki wysokich energii).
Krzysztof Zaremba, R. Sulej;
 Nov. 9, 2006 – May 8, 2008

The aim of this project is to establish the methods of event selection and interaction parameters estimation for the COMPASS experiment. Currently used techniques require manual tuning of the parameters and presumably do not guarantee the highest quality of results. The method of extracting information contained in higher number of parameters and their mutual correlations is needed. Potential solution is the application of the neural network. We propose also the new algorithm for automated control of the network size (constructive network) resistant to the local-minima and over-training problems.

- [Pro18] **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 is 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.

- [Pro19] **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

- [Pro20] **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. 1, 2007 – Nov. 28, 2008

The first aim of the work was to verify whether the design of the concert hall based on the suggested values of acoustic parameters known from literature will bear fruit in a satisfactory quality of sound. The aim of the optimisation was to achieve the preferred values of the acoustic parameters. As a result, two models were constructed – one with classical rectangular and another one with fan-shape audience. The second subject was to project and develop the model of a two-channel acoustic amplifier. The work includes also computer simulations and objective measurements of device's parameters, which were conducted using proper measurement equipment. There are also presented results of sound quality assessment obtained from the group of listeners. The last topic concerned building of a real time digital range controller which can be used in the radio and television recording and broadcasting studios. The main purpose of such system is to increase or decrease the dynamic range of an audio signal in a prescribed way without introducing suggested distortion. The results of both objective and subjective tests were shown.

- [Pro21] **Modern Methods of Computer Measuring Systems Designing** (Nowoczesne metody projektowania komputerowych systemów pomiarowych).
Wiesław Winiecki, K. Mroczek, P. Bilski, R. Łukaszewski, T. Daniluk, J. Olszyna;
 Aug. 1, 2007 – Nov. 28, 2008

The project concerns the distributed measuring systems (DMS). The results of the project include: the development of the methodology of design of measuring systems with time limited data flow, the new method of describing of DAQ and DSP models based on Petri nets with the use of CPN/Tools; the method of designing the real-time virtual instrumentation using ETS configuration and multi-core processors; the method of designing the distributed meas-

uring systems with the use of Zigbee (IEEE 802.15.4) standard.

[Pro22] **Methods of Electromagnetic Simulations and Design of Transmitters for Radiocommunication Systems** (Metody symulacji elektromagnetycznych i projektowania torów nadawczych dla systemów radiokomunikacyjnych).

Wojciech Gwarek, T. Morawski, S. Rosłonec, M. Celuch, D. Gryglewski, M. Sypniewski, A. Więtkowski, P. Kopyt, P. Miazga, W. Wojtasiak, J. Zborowska, K. Robaczyński, B. Salski, D. Rosołowski, M. Sołtysiak, M. Lubiejewski;

Aug. 1, 2007 – Nov. 28, 2008

Methods of electromagnetic simulations have been developed and adapted to new areas of applications, such as multiphysics design of microwave heating systems and indirect measurements of material parameters. These methods have been used in the modelling of optical scatterometry, millimetre wave generation in GaAs field effect transistors, and cross-talk suppression in multiconductor transmission lines. In parallel, methods of microwave amplifier design have been pursued, with a focus on new radiocommunication links and RFID technology.

[Pro23] **Modern Techniques in Nuclear and Medical Electronics** (Nowoczesne techniki elektroniki jądrowej i medycznej).

Krzysztof Zaremba, P. Bogorodzki, P. Brzeski, G. Domański, T. Jamróiewicz, M. Kazubek, B. Konarzewski, J. Marzec, T. Olszewski, E. Piątkowska-Janko, A. Przelaskowski, D. Radomski, W. Smolik, R. Szabatin, P. Bargieł, P. Boniński, R. Kurjata, M. Orzechowski, A. Trybuła, T. Wolak, A. Wróblewska;

Aug. 1, 2007 – Nov. 28, 2008

Patient's glove for brain functional magnetic resonance imaging

The aim of the project was to develop and test fMRI compatible glove called fGlove with accelerometers (based on EMS - *Micro-Electro Mechanical Systems*) placed on each of the fingers in order to measure hand motor activity during fMRI experiments. The fGlove was successfully tested in finger tapping experiment.

Analysis of measurement uncertainty in tissue blood content examination by means of optical technique

The aim of the work was to do an analysis of measurement uncertainty in tissue blood content by means of optical technique. The computer program was prepared for Monte Carlo simulation of photon migration in turbid tissue. A multi-channel device for tissue blood content measurement was elaborated.

Medical images perception improvement with the use of bilinear filtering

A new method of the contrast improvement of medical images was investigated. This method is based on the sequence of two operations: in a first stage a bilinear filtering is used for noise elimination, next a method of contrast modification will be applied. The bilateral filter takes both, geometric closeness and photometric (gray scale) similarity of neighboring pixels into account. We used fast bilateral filter elaborated by Paris and Duran. We observed that the width of Gaussian function determining the influ-

ence of the gray scale difference will increase when the window width on the Dicom viewer decreases.

Integrated workstation for image-based medical diagnosis

Radiology is extremely susceptible to computer-based integrated support in decision-making. Integration of databases, decision-aiding tools (e.g. computer-aided diagnosis - CAD), systems, networks can help to determine what information is needed that a user does not have. All necessary and useful information should be integrated and easily accessed with Radiology Information system (RIS). Decision support tools will provide more information to end-users, but need to be more fully integrated into the PACS (picture archiving & communication systems) database. The integration is essential for improved diagnostic data evaluation, decision making and finally high-quality patient care.

The purpose of our research was the completeness of supplied computer aid to improve the diagnosis. However, visualization and navigation of all accessible medical information requires efficient selection of all the information necessary to make effective clinical decisions without distracting the user, followed by information synthesis. Automation by integration can improve database information quality, as well as facilitate improved user interfaces, computer-aided tools, and preemptive detection of errors before they propagate. The importance of provided information quality, CAD-based support and tele-radiology, flexible adjustment to various needs, and easily accessible examples of pathology cases, quick and precise retrieval (e.g. with content-base indexing & retrieval - CBIR), are crucial

- PACS/RIS/telediagnosis integration,
- integrated user interfaces of every accessible information sources, systems and tools,
- diagnostic workstation integration

PhD thesis, 19 published papers and experimental verification of integrated diagnosis interfaces, technologies and data access points confirmed the usefulness of designed diagnosis environment.

Electrical tomography techniques applied in medicine and industry

In the current year, the works on the volume tomograph have been focused on refining and starting the new version of Electrical Capacitance Tomograph (ECT) for investigation of the two-phase flow structure as gas-solid, gas-liquid, liquid1(water)-liquid2(oil).

To obtain the complex parameters of the flow usually ECT is used in the correlation method. Implementation of the cross-correlation function need two plane tomography sensors with d distance between them, placed on the pipe surface.

[Pro24] **Methods of the Receivers' Synchronization in Digital Broadcasting Systems** (Metody synchronizacji odbiorników radiofonii oraz telewizji cyfrowej).

Yevhen Yashchyshyn, M. Dąbrowski, K. Bryłka, J. Modelski, K. Kurek, T. Keller, K. Derzakowski;

Aug. 1, 2007 – Nov. 28, 2008

The main aim of the statutory work was the analysis of the techniques used for synchronization of the digital receivers STB (Set-Top Boxes) working in the Single Frequency

Networks within DVB-T and T-DAB systems. Main requirements from the regulatory bodies were thoroughly analyzed, some optimal networks' configurations were proposed. Additionally the specific software tools for generating and analyzing the DVB-T signal spectrum both, in baseband and in the pass-band was prepared.

[Pro25] **UWB Transmitters for Localization System** (Ultra szerokopasmowe układy nadawcze do systemów lokalizacyjnych).

Jacek Cichoński, J. Kołakowski, R. Michnowski, K. Radecki, W. Kielek (em.), S. Żmudzin, P. Makal, P. Ziętek;
Aug. 1, 2007 – Nov. 28, 2008

The project covered two investigation areas: generation technique of UWB (Ultra-Wide Band) signals, and design and realization of UWB transmitters. Generally, there are two commonly used techniques of generating signal - by means of signal pulse filtering and the second method - signal pulse up-conversion (mixing). Based on the performed investigation the UWB transmitters intended for localization system were designed and developed. The first circuit works on S band, and consists of pulse amplifier controlled by LVDS receiver, afterwards SRD diode and band-pass filter which form the shape of the UWB signal. The circuit is triggered from control module (CPLD). The second one works on C band, and consists of the comparator which compares reference signal with formed input signal, low pass filter, mixer and VCO generator.

[Pro26] **Applications of Switch-mode Controllable Voltage Regulators in High-power Amplitude Modulators** (Zastosowanie impulsowych zasilaczy sterowanych w układach modulatorów amplitudy o dużej mocy wyjściowej).

Juliusz Modzelewski, W. Kazubski, M. Mikołajewski, H. Chaciński;
Aug. 1, 2007 – Nov. 28, 2008

The project concerns the high-efficiency switched-mode supply unit controlled by the external audio signal (50Hz – 4.5kHz), destined for high-power amplitude modulators of HF carrier in radio AM transmitters. This supply unit is based on the buck DC-DC converter in which the modulating audio signal is summed with the DC reference voltage. Due to high-gain feedback loop the output voltage is proportional to the instantaneous value of the resultant reference voltage. The stability of the controllable supply unit and the wide band of modulating audio signals have been obtained by the lag-lead compensation of frequency characteristics of the feedback loop. The experimental medium-power controllable buck converter ($V_{Omax}=20V$, $I_{Omax}=2A$) with the typical IC controller of DC/DC converter (UC1225A) was built and tested. The measured parameters of this converter are satisfactory (full-power band 5.3kHz, THD<3%, efficiency 86-91%).

[Pro27] **Radiocommunication Signals and Systems** (Sygnały i systemy radiokomunikacyjne).

Tomasz Kosiło, S. Hahn, J. Wojciechowski, T. Buczkowski, K. Czerwiński, J. Jarkowski, W. Kazubski, K. Snopek, Z. Walczak;
Aug. 1, 2007 – Nov. 28, 2008

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.

[Pro28] **Methodology for Interpretation of Measurement Data** (Metodyka interpretacji danych pomiarowych).

Roman Z. Morawski, A. Miękina, A. Podgórski;
Aug. 1, 2007 – Nov. 28, 2008

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. The results of the project include: a systematic approach of the design-and-implementation issues related to applications of digital signal processing in biochemical and electro-acoustic measurements, as well as some preliminary consideration concerning applicability of measurand reconstruction theory in soft metrology. The results of the research accomplished have been partially published in two journal papers, in two book chapters, and in a conference paper.

[Pro29] **Audiovisual Network Hybrid Systems** (Audio-wizualne sieciowe systemy hybrydowe).

Krystian Ignasiak, W. Skarbek, G. Galiński, A. Buchowicz, G. Pastuszek, S. Badura, M. Leszczyński, J. Naruniec, A. Nowakowski, M. Tomaszewski;
Aug. 1, 2007 – Nov. 28, 2008

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 has been created and extended.

4.3.2 Projects granted by the Rector

[Pro30] **Laboratory Verification of the VeriPro Metod for Testing Ear-plugs Attenuation** (Weryfikacja metody VeriPRO badania tłumienia dźwięku wkładek przeciwhałasowych w warunkach laboratoryjnych).

Wiesław Winiecki, E. Kotarbińska;
Mar. 19 – Dec. 31, 2008

The VeriPro method, worked out by the Sperian Hearing Protection LLC Laboratory (San Diego, USA), is based on an alternate binaural loudness balance. The aim of the study is to compare VeriPRO estimates of attenuation with Real-Ear-at-Threshold (REAT) estimates for 10 models of brand new ear-plugs. The test was carried on with listener group of 16 trained subjects. The subjects met requirements of the standard PN- EN 24869-1.

[Pro31] **Implementation of Cardiological Monitoring System and Execution of Short Series of Telemetric ECG** (Wdrożenie systemu monitoringu kardiologicznego oraz wykonanie krótkiej serii telemetrycznych aparatów EKG).

Ewa Piątkowska-Janko, P. Chmielewski, P. Kamiński, W. Obrębski, A. M. Laskowski, B. Radzik;
Apr. 18 – Dec. 31, 2008

The goal of the project was the implementation of cardio-monitoring system based on designed portable ECG system with localization capability through GPS chip. Five ECG systems were built and tested.

[Pro32] **Communications System for Pico-satellite** (Satelitarny moduł komunikacji pokładowej).

Krzysztof Kurek, M. Stolarski, A. Cichocki
Apr. 18 – Dec. 31, 2008

The aim of the project was the realization of universal communications system for cubesat pico-satellite. The system realizes communications between the satellite and the ground station in radio amateur frequency band, allowing to receive telecommands and send telemetry data. The developed communications system will be used in PW-Sat, first Polish satellite built by students of WUT.

[Pro33] **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 in 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.

4.3.3 Projects granted by the Dean

[Pro34] **Project and Investigations of Units Applied for Hyperpolarized MRI Contrast Media** (Projekt i badania układów hyperpolaryzacji w zastosowaniu do obrazowania techniką MR).

Piotr Bogorodzki, I. Wawer, M. Pisklak, W. Szeszkowski, J. Krupka, J. Piotrowski, J. Skulski, E. Piątkowska-Janko, M. Kazubek, W. Obrębski, T. Jamrógiewicz;
Apr. 25, 2008 - Dec. 31, 2008

The aim of the project was to learn about hyper-polarization process of some nuclei used in magnetic resonance imaging technique (MRI). A typical MRI image shows spatial concentration of hydrogen nuclei bounded in water molecules. Other nuclei like: ^3He , ^{129}Xe , ^{13}C can be also imaged, but due to either small natural abundance or density they require special preparation. One of possible solutions is so called hyperpolarization. It uses microwave radiation or circularly polarized laser light in order to build-up electronic polarization, which thereafter can be transferred to nuclear polarization with spin-spin exchange process.

[Pro35] **The Evaluation of the Selected Predictive Algorithms Controlling Insulin Dosing in Diabetic Patients** (Badanie wybranych algorytmów regulacji predykcyjnej w dawkowaniu insuliny u chorych na cukrzycę).

Dariusz Radomski, A. Przelaskowski, M. Ławryńczuk, P. Marusak, P. Tatjewski;
Apr. 25, 2008 - Dec. 31, 2008

The aim of the research is to elaborate the computationally efficient predictive control approaches to stabilization of the blood glucose concentration in patients suffering from diabetes type 1. These algorithms are based on the introduced neural and fuzzy models which approximate a nonlinear dynamic of an insulin-glucose relationship. The proposed control methods offer much better control performance than the algorithms based on linear models. Moreover, their closed-loop accuracy is similar to that obtained in predictive control algorithms with full nonlinear optimization repeated on-line. Although simple, such algorithms offer advantages resulting from its prediction capabilities.

[Pro36] **Security of Distributed Measurement and Control Systems with Asymmetric Computational Resources** (Bezpieczeństwo sieci typu RSPS o asymetrycznych zasobach obliczeniowych).

Tomasz Adamski, W. Winiecki, R. Łukaszewski, P. Bobiński, T. Owczarek, P. Bilski, J. Olszyna;
Apr. 25, 2008 - Dec. 31, 2008

The grant deals with information security of DMCS (Distributed Measurement and Control Systems). The specific properties of DMCS like asymmetric structure of computational resources of hosts (i.e. asymmetry of computational power, asymmetry of memory capacity and asymmetry of power supply) lead to the necessity of applying special algorithmic and hardware solutions well suited DMCS networks. To assure information security in such specific networks we have proposed special carefully chosen methods, algorithms and circuits. Special attention was paid to low power solutions (low complexity cryptographic

algorithms and dedicated circuits). The main results of the grant are the following:

- low power cryptographic software and hardware solutions for secured DMCS networks (Barrett algorithm, Montgomery algorithm, small exponent algorithms implemented in parallel and systolic structures);
- methodology how to use multi-core processors to secure DMCS with some specific examples (like AES implementation);
- assessment of security level in quantum cryptography systems applied to DMCS (probabilistic properties of protocols);
- Large Numbers Library for Lab View and Lab Windows (set of primitives, basic procedures) which are building blocks of cryptographic systems (in particular public key cryptosystems). Secure DMCS networks can be designed using developed Large Numbers Library.

[Pro37] **Transductive Classifiers Optimization by Means of Cross-Estimation Tests and Application in Cardiology and Bioinformatics** (Optymalizacja klasyfikatorów transdukcyjnych na podstawie testów oceny krzyżowej i zastosowania w kardiologii i bioinformatyce).

Ewa Piątkowska-Janko, S. Jankowski, A. Oręziak, 30h/sem.; semester L. Wyrwicz, Z. Szymański, J. Będkowski, P. Danielewicz, T. Rubel;

Apr. 25, 2008 - Dec. 31, 2008

A new learning classifier is presented in the form of transductive least squares support vector machine – TLS-SVM. The transductive inference is based on the influential statistics of data set, i.e. by applying the virtual leave-one-out score. In the considered system this test can be expressed as the analytic formula, hence it is numerically efficient. The presented learning classifier was successfully applied to computer-aided medical diagnosis: signal-averaged electrocardiograms (SAECG) selected and commented by cardiologists of the Warsaw University of Medicine.

4.4 Other projects

[Pro38] **Radiocommunication Systems of the Future Generation** (Systemy radiokomunikacyjne przyszłych generacji).

Józef Modelski; Y. Yashchyshyn, T. Keller, K. Kurek, P. Bajurko, M. Bury, D. Kolmas, S. Kozłowski, A. Kurek, M. Stolarski, R. Szumny, P. Ziętek, M. Dąbrowski, K. Bryłka;

Jun. 8, 2005 – Jun. 8, 2008

Funded by the Foundation for Polish Science (Fundacja na Rzecz Nauki Polskiej).

In the project the research activities concentrate on: smart antennae (reconfigurable systems with electronic beam control, ferroelectric structures, multiple input, multiple output, MIMO systems, SAR/ISAR techniques); short range wireless systems (ultra wide-band UWB systems, compatibility WPAN and WLAN systems); radio navigation systems (localization of radio terminal inside and outside buildings, navigation systems for urban areas with high buildings).

[Pro39] **Development of Photo Player and Advanced Video Player Technologies** (Opracowanie technologii i oprogramowania dla Photo Player and Advanced Video Player Technologies).

Władysław Skarbek, K. Wnukowicz;

Feb. 1, 2007 – Mar. 31, 2008

Funded by Mitsubishi Electric Information Technology Center European B.V.

The project was a continuation of the previous work for development of MPEG-2 library of functions and Advanced Video Player application. The objective of this project was to develop an Advanced Video Player which allows for fast shot/scene/chapter navigation and video browsing using pre-computed video meta-data. The project consisted of 2 work-packages: 1) the development of MPEG-2 library of functions and associated GUI; 2) the development of Advanced Video Player. The functionality developed in the first work-package is "find matching frame/segment". In the second work-package the Advanced Video Player was extended by new functions and mobile version of AVP was developed. The additional objective of the project was the maintenance of the developed software modules and improvements according to user feedback.

[Pro40] **Construction of Five 3.5 GHz Diplexers for IRT System** (Wykonanie 5 szt. diplexerów 3,5 GHz dla systemu IRT).

Daniel Gryglewski, W. Wojtasiak, M. Lubiejewski; Feb. 4, 2008 – Feb. 22, 2008

Funded by Ericson Ltd.

The goal of this project was to construct five 3.5 GHz diplexers in order to confirm the suitable conditions of their work. It was the main subject of this work.

[Pro41] **Project and CC-link Interface Construction** (Projekt oraz wykonanie układu interfejsu CC-link).

Krzysztof Zaremba, M. Ziembicki, G. Domański, B. Konarzewski, R. Kurjata;

Jan. 22, 2008 – Mar. 6, 2008

Funded by Northern Design Electronics, Bradford, UK

The aim of the project was to develop a CC-Link interface board for the energy meters manufactured by the Northern Design company. The following tasks were completed: development of the PCB design and the software for the on-board microcontroller, assembly of four prototype units, preparation of project documentation.

[Pro42] **New Neutron Detection Techniques in Industrial and Customs Applications** (Opracowanie i wykonanie układów elektronicznych do detektorów radiologii, 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.

[Pro43] **Sound Recordings in an Anechoic Chamber** (Rejestracja sygnałów dźwiękowych w komorze bezechowej).

Zbigniew Kulka, P. Nykiel;

Mar. 20, 2008 – Mar. 28, 2008

Funded by FORTE Ltd. Company

Number of short sentences in Polish language pronounced by masculine and feminine lectors have been recorded. The recordings were employed in the audiovisual HINT (Hearing in Noise Tests) system for hearing aids.

[Pro44] **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.

[Pro45] **Construction of 2.4 GHz/ 4.4 GHz Signal Converters** (Wykonanie konwerterów sygnału 2,4 GHz/4,4 GHz).

Daniel Gryglewski, Wojciech Wojtasiak, M. Lubiejewski;

Jul. 9, 2008 – Sept. 30, 2008

Funded by Military Communication Institute (Wojskowy Instytut Łączności).

The Institute of Radioelectronics has no responsibility for obtaining any intellectual property rights of issued results to be performed.

[Pro46] **Consulting of Feasibility of Installation of Several Air-traffic Control Systems on a Single Antenna Mast** (Opracowanie ekspertyzy dotyczącej analizy możliwości bezbłędnej pracy systemu DME (radiolatarnia do pomiaru odległości pracująca w paśmie 960-1215 MHz) i radiostacji ziemia-powietrze ACC (pasmo VHF i UHF) w przypadku montażu anten obu systemów na jednym maszcie antenowym).

Wojciech Gwarek, D. Gryglewski, P. Kopyt, W. Wojtasiak;

Aug. 4, 2008 – Oct. 10, 2008

Funded by Polish Air Navigation Services Agency (Polska Agencja Żegluga Powietrznej).

The problem of possible interference between distance measuring equipment and equipment voice communication with aircraft crew has been investigated from the system and electromagnetic perspectives. While installation of both systems on a single mast is very desirable from the economical point of view, its technical implications have been studied and related to system reliability. Full-wave 3D electromagnetic simulations of the mast environment including several antennas working in close proximity have been performed.

[Pro47] **Construction of Computer-Controlled System of Several Microwave Power Generators** (Sterowany komputerowo system wielu generatorów mikrofalowych)

Wojciech Gwarek, W. Wojtasiak, D. Gryglewski, P. Przybyszewska, P. Korpas, M. Lubiejewski

Nov. 29, 2007 – Sept. 30, 2008

Funded by industrial partner from Sweden

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

[Pro48] **Construction and Sale of the Tools Designed for Brain Imaging (fMRI)** (Wykonanie i sprzedaż zestawu urządzeń do badań czynnościowych fMRI).

Ewa Piątkowska-Janko

Aug. 31, 2008 – Oct. 6, 2008

Funded by Siemens Ltd. Company

Constructional sale of the software and hardware tools designed for brain studies with the aid of functional Magnetic Resonance Imaging (fMRI) - a synchronizing module, response pads, sound delivery system, paradigm design software.

4.5 Other activities

4.5.1 Reviews of Projects

Reviews of Projects within the Frame of the EU Structural Funds (Recenzje projektów europejskich).

Jacek Wojciechowski

Reviews of Projects within the Frame of the EU Action (Recenzje projektów europejskich) Reviews for the Center of Technology Transfer, Warsaw University of Technology. Implementation of new technologies and ERP software in the company Europa Systems; Integrated logistic system in container cooling storage, D.J.M. Chłodnia, Grudziądz; Software system DBT Studio, PARP; Implementation of Microsoft Dynamics – AX system in Terma Technologies; Server cluster for distributed systems. VSOFT Company; Identification system for containers', identification exploiting RFID techniques, "Siódemka", sp. z o.o. ("Siódemka" Ltd. Company).

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 informa-

tion 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 concentrates 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 Students' 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 from 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 can not perform a duty separately. Though it is the prime year, the members of SKNTechMed have a lot of ideas for the beginning:

- series of open lectures for student leaded by interesting people from the world of knowledge;
- 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] Piotr Boniński: *"Metody indeksowania obrazów medycznych na potrzeby radiologii cyfrowej"* (Content-based indexing of medical images for digital radiology applications), Prof. **A. Przelaskowski** (supervisor), Warsaw, May 20, 2008.
- [PhD2] Rafał Szumny: *"Metoda lokalizacji terminali radiowych wewnątrz budynków"* (Method of localization of radio terminals inside buildings), Prof. **J. Modelski** (supervisor), Warsaw, Jun. 3, 2008.
- [PhD3] Arkadiusz Trojanowski: *"Liniowa prognoza kanału radiowego z zanikiem Rayleigha"* (Linear radio channel prediction with Rayleigh channel), Prof. **J. Wojciechowski** (supervisor), Warsaw, Jan. 15, 2008.
- [PhD4] Anna Wróblewska: *"Metody wspomaganie detekcji zmian patologicznych w mammografii"* (Methods of pathological changes detection supporting in mammography), Prof. **A. Przelaskowski** (supervisor), Warsaw, Jun. 17, 2008.

5.2 M.Sc. Degrees

- [MSc1] Dariusz Andrzej Adasiak: *"Mikrofalowy nadajnik sygnałów testowych w technice SDR"* (Microwave SDR transmitter of testing signals), Assist. Prof. **W. Wojtasiak** (supervisor), (5).
- [MSc2] Michał Andrasiak: *"System wizualizacji algorytmów ewolucyjnych"* (Visualization system for evolutionary algorithms), Prof. **K. Zaremba** (supervisor), (5).
- [MSc3] Karol Baca: *"System do pomiaru nieskoordynowanych drgań kończyn w chorobie Parkinsona"* (System for measurement of uncoordinate tremble in Parkinson disease), Assist. Prof. **M. Kazubek** (supervisor), (5).
- [MSc4] Maciej Bielecki: *"Metoda analizy populacyjnej obrazów tensora dyfuzji (DTI)"* (A group analysis method for Diffusion Tensor Imaging (DTI)), Assist. Prof. **P. Bogorodzki** (supervisor), (5).
- [MSc5] Filip Borowski: *"Detektor aktywności głosowej dla systemów weryfikacji mówcy"* (Voice activity detector for speaker verification systems), Prof. **W. Skarbek** (supervisor), (5).
- [MSc6] Magdalena Bujak: *"Analiza mechanizmów warstwy łącza danych w systemie telewizji mobilnej DVB-H"* (Analysis of the data link layer mechanisms in standard of the mobile television DVB-H), Assist. Prof. **T. Keller** (supervisor), (4).
- [MSc7] Nelly Chelstowska: *"Analiza wybranych technologii multimedialnych pod kątem możliwości zastosowania ich do realizacji koncepcji Uniwersalnego Dostępu do Multimedii"* (Analysis of selected multimedia technologies in the aspect of

their ability for realization of the Universal Multimedia Access Concept), Assist. Prof. **A. Buchowicz** (supervisor), (4).

- [MSc8] Radosław Ciszewski: *"Implementacja fonicznego graficznego korektora charakterystyki częstotliwości na procesorze sygnałowym"* (Implementation of a 10-band graphic audio equalizer on digital signal processor), Prof. **Z. Kulka** (supervisor), (5).
- [MSc9] Paweł Jan Czernik: *"Synchronizacja bezprzewodowych systemów pomiarowo-sterujących z wykorzystaniem protokołu NTP i sieci ZigBee"* (Time synchronization of wireless control-measuring systems based on NTP protocol and ZigBee network), Prof. **W. Winiecki** (supervisor), (5).
- [MSc10] Michał Daras: *"Konwerter WLAN 2,4 GHz – 4,4 GHz"* (The design of 2.4 GHz – 4.4 GHz WLAN converter), Assist. Prof. **D. Gryglewski** (supervisor), (5).
- [MSc11] Sebastian Denis (co-author: Tomasz Gałkowski): *"Projekt i realizacja subwoofera aktywnego z zastosowaniem cyfrowego przetwarzania sygnałów"* (Project and realization of active subwoofer using digital signal processing), Prof. **Z. Kulka** (supervisor), (5).
- [MSc12] Magdalena Krystyna Długosz: *"System dydaktyczny do analizy i filtracji sygnałów EKG"* (Didactic system for analysis and filtration of ECG signals), Assist. Prof. **E. Piątkowska-Janko** (supervisor), (4.5).
- [MSc13] Maciej Dudziński: *"Propagacja fali elektromagnetycznej w budynku w paśmie 1,9 GHz"* (Indoor propagation of the electromagnetic wave in 1.9 GHz band), Senior Lecturer **H. Chaciński** (supervisor), (4).
- [MSc14] Piotr Dzioba (co-author: Jarosław Węgorek): *"Implementacja sprzętowo-programowego odbiornika standardu DRM"* (Implementation of a hardware and software DRM receiver), Assist. Prof. **W. Kazubski** (supervisor), (5).
- [MSc15] Jacek Falkowski: *"Program kliniczny do analizy dynamicznych badań scyntygraficznych z zastosowaniem techniki dekonwolucji"* (Clinical program for analysis of dynamical scintigraphic studies with application of deconvolution technique), **P. Brzeski**, Docent, (supervisor), (4.5).
- [MSc16] Tomasz Gałkowski (co-author: Sebastian Denis): *"Projekt i realizacja subwoofera aktywnego z zastosowaniem cyfrowego przetwarzania sygnałów"* (Project and realization of active subwoofer using digital signal processing), Prof. **Z. Kulka** (supervisor), (5).
- [MSc17] Rafał Głogowski: *"Badanie możliwości zastosowania algorytmu PSO do sterowania antenami inteligentnymi"* (Investigating the capabilities of

- using PSO algorithm to control smart antennas), Assoc. Prof. **Y. Yashchyshyn** (supervisor), (5).
- [MSc18] Adam Grabowski: *"Kwadraturowy 3dB sprzęgacz kierunkowy o dużej dociężalności energetycznej przeznaczony do pracy w zakresie 144 MHz"* (The broadband 3dB/90° directional coupler), Prof. **S. Rosłonec** (supervisor), (5).
- [MSc19] Piotr Gregorczyk: *"Model wyspowy algorytmów genetycznych"* (Island model of genetic algorithms), Prof. **K. Zaremba** (supervisor), (5).
- [MSc20] Maciej Grela: *"Mikrofalowy odbiornik SDR z bezpośrednią przemianą częstotliwości"* (Microwave SDR receiver using the direct conversion architecture), Assist. Prof. **W. Wojtasiak** (supervisor), (5).
- [MSc21] Przemysław Gruzdź: *"System rejestracji, obsługi i analizy sygnałów alarmowych. Analiza funkcjonalna i projekt techniczny"* (System for registering, processing and analyzing alarm events. Functional analysis and low level design), Assist. Prof. **M. Kazubek** (supervisor), (4,5).
- [MSc22] Bartosz Mikołaj Hrehoruk: *"Analiza termiczno-elektryczna elementów z węglika krzemu dla potrzeb radiokomunikacji"* (Thermoelectric analysis of silicon carbide devices for radiocommunication needs), Assist. Prof. **D. Gryglewski** (supervisor), (5).
- [MSc23] Adam Kalisz: *"Analiza wpływu konfiguracji przestrzennej detektorów promieniowania jonizującego na parametry toru obrazowania"* (Analysis of influence of spatial configuration of X-ray detectors on imaging system parameters), Assist. Prof. **B. Konarzewski** (supervisor), (5).
- [MSc24] Tomasz Kołcon: *"Densytmierz laboratoryjny z łączem ETHERNET"* (A laboratory densitometer with an ETHERNET link), Assist. Prof. **G. Domański** (supervisor), (5).
- [MSc25] Jan Kosiński: *"Układy sterujące w ultraszerokopasmowym systemie lokalizującym"* (Implementation of control modules in ultrawideband localization system), Assist. Prof. **J. Kołakowski** (supervisor), (5).
- [MSc26] Michał Kozarzewski: *"Analiza efektywności wybranych implementacji algorytmów kryptograficznych i funkcji mieszających w systemach wbudowanych"* (Analysis of effectiveness of chosen implementations of cryptographic algorithms and hash functions in embedded systems), Assist. Prof. **K. Mroczek** (supervisor), (4).
- [MSc27] Jakub Krajewski: *"Wykorzystanie algorytmów ewolucyjnych do wyszukiwania w dziedzinie proteomiki"* (The use of evolutionary algorithms for searching in proteomic field), Prof. **K. Zaremba** (supervisor), (5).
- [MSc28] Maciej Krysa: *"Układ akwizycji sygnałów ultraszerokopasmowych"* (Ultra-wideband signal acquisition module), Assist. Prof. **S. Maszczyk** (supervisor), (5).
- [MSc29] Tomasz Krzyżewski: *"Porządkowanie informacji w celu poprawy jakości progresji strumienia JPEG 2000"* (Information ordering to improve quality of stream progression in JPEG 2000), Prof. **A. Przelaskowski** (supervisor), (5).
- [MSc30] Michał Kubiak: *"Fizyczny model skrzypiec oparty na metodzie falowodowej i ich implementacja z wykorzystaniem procesora sygnałowego"* (The physical model of violin based on digital waveguide modeling and its implementation with the use of the digital signal processor), Assist. Prof. **P. Bobiński** (supervisor), (5).
- [MSc31] Katarzyna Kulma: *"Analiza wpływu skończonej dobroci cewki na charakterystyki dowodów rezonansowych typu $\pi 1$ do wzmacniaczy mocy w.cz."* (Analysis of influence of finite inductor quality factor on frequency response of $\pi 1$ resonant circuits for h.f. power amplifiers), Assist. Prof. **J. Modzelewski** (supervisor), (5).
- [MSc32] Jacek Kuś: *"Analiza przebiegów EKG ze szczególnym uwzględnieniem detekcji bezdechu periodycznego"* (Analysis of ECG signals especially focused on detection of obstructive sleep apnea), Assist. Prof. **E. Piątkowska-Janko** (supervisor), (5).
- [MSc33] Krzysztof Lis: *"Urządzenie do pomiaru krótkich odcinków czasu z subnanosekundową rozdzielczością"* (Sub-nanosecond resolution time interval measurement device), **J. Cichocki**, Docent (supervisor), (5).
- [MSc34] Jakub Lubartowski: *"Analiza konstrukcyjna urządzenia do funkcjonalnego badania mózgu metodą dyfuzyjnej tomografii optycznej"* (Design analysis of diffuse optical tomography instrumentation for brain functional imaging), Assist. Prof. **G. Domański** (supervisor), (5).
- [MSc35] Konrad Łakomic: *"Projektowanie zasięgów stacji bazowych w oparciu o technikę GiS"* (Design of base stations coverage on the basis of the GiS technology), Assist. Prof. **J. Jarkowski** (supervisor), (4).
- [MSc36] Michał Maćkowiak: *"Geometrically based multi-bounce MIMO channel models"*, Assist. Prof. **J. Kołakowski** (supervisor), (5).
- [MSc37] Piotr Makal: *"UWB antennas for wireless applications"*, Assist. Prof. **J. Kołakowski** (supervisor), (5).
- [MSc38] Jacek Tadeusz Malesa: *"System kontroli barwy w obrazowaniu medycznym"* (Colour management system in medical image), **R. Szabatin**, Docent (supervisor), (4).
- [MSc39] Michał Mirosław: *"Oprogramowanie sterująco-pomiarowe rentgenowskiego tomografu komputerowego"* (X-ray computer tomograph control and data acquisition software), Assist. Prof. **W. Smolik**, (supervisor), (5).
- [MSc40] Wojciech Obrębski: *"Pobudzenie adiabaticzne w obrazowaniu techniką rezonansu magnetycznego (MR)"* (Adiabatic pulse in Magnetic

TITLES AND DEGREES AWARDED

- Resonance Imaging (MRI)), Assist. Prof. **P. Bogorodzki** (supervisor), (5).
- [MSc41] Marta Ochocka: *"Porównywanie metod wykrywania ujęć sekwencji wideo"* (Shot boundary detection in the video sequences), Assist. Prof. **G. Galiński** (supervisor), (4).
- [MSc42] Mateusz Ogonowski: *"Elektryczny tomograf pojemnościowy"* (Electrical capacitance tomograph) **R. Szabatin**, Docent (supervisor), (5).
- [MSc43] Jerzy Ołdak: *"Oprogramowanie do analizy statystyk ilościowych i jakościowych systemu Nortel PicoNode"* (The software designed for analysing of Nortel PicoNode performance measurements), Assist. Prof. **J. Kołakowski** (supervisor), (5).
- [MSc44] Marcin Orłowski: *"Audiostim" - system kalibracji bodźców akustycznych* ("Audiostim" - calibration system of audio stimulation), Assist. Prof. **P. Bogorodzki** (supervisor), (5).
- [MSc45] Grzegorz Ostrek: *"Analiza obrazu z wykorzystaniem falek kierunkowych"* (Image analysis using directional wavelets), Prof. **A. Przelaskowski** (supervisor), (5).
- [MSc46] Tomasz Piotr Ostrowski: *"Lampowy wzmacniacz gitarowy o parametrach sterowanych cyfrowo"* (Guitar vacuum-tube amplifier with digital remote control system), Prof. **Z. Kulka** (supervisor), (5).
- [MSc47] Piotr Piekarek: *"System for simulation test of ultrawideband signals reception"*, **J. Cichocki**, Docent, (supervisor), (4).
- [MSc48] Wojciech Pilip: *"Analiza wykorzystania algorytmu V-BLAST w wieloantenowych systemach komunikacji bezprzewodowej"* (The analysis of using V-BLAST algorithm in multiple antennas wireless communication systems), Assist. Prof. **T. Keller** (supervisor), (4).
- [MSc49] Przemysław Pomiankiewicz: *"Renowacja archiwalnych materiałów filmowych metodami cyfrowymi"* (Restoration of archival film material using digital techniques), Assist. Prof. **G. Galiński** (supervisor), (5).
- [MSc50] Radosław Józef Ponikowski: *"Wykorzystanie algorytmu analizy składowych niezależnych do separacji sygnałów"* (The usage of independent component analysis in signal separation), Assist. Prof. **G. Domański** (supervisor), (5).
- [MSc51] Ha Quang Huy: *"Technologia bezprzewodowa WiMAX i symulacja sieci trybu PMP na NCTUNS 4.0"* (Technology wireless WiMAX and simulation with configuration PMP by NCTUN ver. 4.0), **T. Kosiło**, Docent (supervisor), (4).
- [MSc52] Ewa Protaś: *"Analiza sygnału elektrohistograficznego"* (Nonlinear analysis of electrohysteroqram), Assist. Prof. **D. Radomski** (supervisor), (5).
- [MSc53] Leszek Radecki: *"Metody śledzenia kontrastu w badaniach USG"* (Methods of tracking the contrast in USG research), Prof. **A. Przelaskowski** (supervisor), (4.5).
- [MSc54] Dominik Reszka: *"Program do symulacji metodą MONTE CARLO propagacji fotonów w tkankach"* (Program for MONTE CARLO simulation propagation of photon in tissue), Assist. Prof. **G. Domański** (supervisor), (4).
- [MSc55] Marek Rogala: *"Problem wysokiego współczynnika impulsowości sygnału OFDM – metody probabilistyczne redukcji współczynnika PAPR oraz ich usprawnienie w systemie OFDM standardu IEEE 802.11a"* (OFDM technique – PAPR reduction), **T. Kosiło**, Docent (supervisor), (5).
- [MSc56] Paweł Rola: *"Zrównoważony ogranicznik mikrofalowy na pasmo X"* (X band microwave balanced limiter), Assist. Prof. **W. Wojtasiak** (supervisor), (4.5).
- [MSc57] Łukasz Rymaszewski: *"Projekt elementów nadajnika i odbiornika sygnałów cyfrowych do łączności satelitarnych z wykorzystaniem struktur FPGA"* (Design of elements of digital transmitter and receiver for satellite communications in FPGA structures), Assist. Prof. **K. Kurek** (supervisor), (4.5).
- [MSc58] Wiktor Rynowiecki: *"Badanie jakości transmisji w radiowej pętli abonenckiej punkt-wielopunkt na przykładzie systemu IRT 2000"* (Point to multi-point wireless local loop transmission quality analysis based on IRT 2000 system), Assist. Prof. **W. Wojtasiak** (supervisor), (4).
- [MSc59] Bolesław Sawa: *"Projekt uniwersyteckiego centrum przetwarzania danych"* (The project of a university data-center), Assist. Prof. **K. Czerwiński** (supervisor), (4).
- [MSc60] Piotr Siedlecki: *"Mikroprocesorowe urządzenie czasowo-startowe"* (Microprocessor-based timer device), Assist. Prof. **K. Derzakowski** (supervisor), (5).
- [MSc61] Marta Skiba: *"Rozpoznawanie numerów tablic rejestracyjnych"* (Car license plate recognition), Assist. Prof. **K. Ignasiak** (supervisor), (5).
- [MSc62] Katarzyna Suska: *"Projektowanie sieci jednoczęstotliwościowych w systemach telewizji DVB-H"* (Designing of one-frequency networks in DVB-H television systems), Assist. Prof. **T. Keller** (supervisor), (5).
- [MSc63] Waldemar Sykacz: *"Program do symulacji czasowej propagacji światła metodą Monte Carlo"* (The program for time resolved Monte Carlo simulation of photon propagation), Assist. Prof. **G. Domański** (supervisor), (4).
- [MSc64] Michał Szajba: *"Wpływ technik korekcji na zachowanie systemu 802.16 w środowisku propagacji wielodrogowej"* (Influence of correction technique on performance of 802.16 systems in environment with multipath propagation), Assist. Prof. **T. Keller** (supervisor), (5).

- [MSc65] Marcin Szymański: *“Analiza sygnału DRM czasu rzeczywistego z uwzględnieniem różnych parametrów odbioru”* (Analysis of a real-time DRM signal taking into consideration various reception parameters), Senior Lecturer **H. Chaciński** (supervisor), (5).
- [MSc66] Łukasz Tybulewicz: *“Implementacja iteracyjnych algorytmów rekonstrukcji obrazów w elektrycznej tomografii pojemnościowej”* (The implementation of iterative image reconstruction techniques in electrical capacitance tomography), Assist. Prof. **W. Smolik** (supervisor), (5).
- [MSc67] Konrad Tymiński: *“Symulacja toru transmisji danych z modulacjami PSK w środowisku SPW”* (Simulation of data transmission with PSK modulation in SPW environment), Assist. Prof. **K. Ra-decki** (supervisor), (5).
- [MSc68] Piotr Wacholski: *“Wykorzystanie standardu komunikacji radiowej Bluetooth do sterowania odbiornikiem cyfrowej telewizji satelitarnej standardu DVB”* (Adaptation of wireless Bluetooth communication standard for remote control of DVB's set top box), Assist. Prof. **T. Keller** (supervisor), (5).
- [MSc69] Michał Wachowiak: *“Optymalizacja pomiarów w polu fal odbitych z wykorzystaniem metody MLS”* (Optimizing diffuse sound field measurement parameters using maximum-length-sequence technique), Assist. Prof. **M. Tajchert** (supervisor), (4.5).
- [MSc70] Jarosław Węgorek (co-author: Piotr Dzioba): *“Implementacja sprzętowo-programowego odbiornika standardu DRM”* (Implementation of hardware and software DRM receiver), Assist. Prof. **W. Kazubski** (supervisor), (5).
- [MSc71] Paweł Węgrzyniak: *“System bezprzewodowej transmisji mocy w paśmie 2,45 GHz”* (Wireless power transmission system working at 2.45 GHz), Prof. **W. Gwarek** (supervisor), (5).
- [MSc72] Marcin Wielechowski: *“Program do symulacji propagacji światła w tkankach metodą różnic skończonych”* (Application simulating light diffusion inside tissues using finite differences method), Assist. Prof. **G. Domański** (supervisor), (5).
- [MSc73] Łukasz Winiarski: *“Detektor impulsów ultra-szeokopasmowych”* (Ultra wideband signals detector), Assist. Prof. **J. Kołakowski** (supervisor), (5).
- [MSc74] Wojciech Zieliński: *“Obiektywna ocena jakości sygnałów fonicznych na podstawie rekomendacji ITU-R Bs.1387”* (Objective assessment of sound signal quality based on recommendation ITU-R Bs.1387), Assist. Prof. **M. Tajchert** (supervisor), (4.5).
- [MSc75] Monika Ziółkowska: *“Scalable distributed video coding”*, Assist. Prof. **A. Buchowicz** (supervisor), (5).

5.3 B.Sc. Degrees

- [BSc1] Sebastian Bałtruszewicz: *“Akustyka studia nagrań”* (Acoustics of recording studio), Assist. Prof. **M. Tajchert** (supervisor), (4.5).
- [BSc2] Paweł Bajurko: *“Radiowy system orientacji terenowej dla osób niewidomych”* (Radio beacon system for locomotion assistance of blind persons), Assist. Prof. **T. Buczkowski** (supervisor), (5).
- [BSc3] Łukasz Bańka: *“P2P nets based simulation of an Internet audio streaming application”*, Assist. Prof. **K. Ignasiak** (supervisor), (5), studies in English.
- [BSc4] Tyberiusz Berlicki: *“Bezprzewodowy analizator stanu magistrali USB”* (Wireless USB bus analyzer), Senior Lecturer **T. Jamrógielwicz** (supervisor), (5).
- [BSc5] Bartosz Bielawski: *“Konwerter MIDI do SPI”* (MIDI to SPI converter), Assist. Prof. **P. Bobiński** (supervisor), (5).
- [BSc6] Agnieszka Brzeska: *“Metody eksploracji danych multimedialnych”* (The methods of multimedia mining), Prof. **A. Przelaskowski** (supervisor), (5), Warsaw University of Technology Distant Learning Center (Ośrodek Kształcenia na Odległość PW).
- [BSc7] Wiktor Chabowski: *“Generator sygnału systemu DCF77”* (Generator of DCF77 signal), Senior Lecturer **H. Chaciński** (supervisor), (5).
- [BSc8] Bartosz Dudek: *“Improvement of MPEG video data perception”*, Prof. **A. Przelaskowski** (supervisor), (4), studies in English.
- [BSc9] Maciej Dudziński: *“Propagacja fali elektromagnetycznej w budynku w paśmie 1,9 GHz”* (Indoor propagation of the electromagnetic wave in 1.9 GHz band), Senior Lecturer **H. Chaciński** (supervisor), (4).
- [BSc10] Tomasz Dziurko: *“Baza danych urządzeń audio-wizualnych – aplikacja internetowa”* (Database of audiovisual devices – internet applications), Prof. **W. Skarbek** (supervisor), (5).
- [BSc11] Radosław Filipiuk: *“Przetwornica napięcia stałego o mocy 1,5 kW”* (PFC for 1.5 kW power), Assist. Prof. **M. Mikołajewski** (supervisor), (3,5).
- [BSc12] Łukasz Gawek: *“Uruchomienie i przetestowanie systemu do pomiaru drżenia kończyn”* (Start-up and testing of the limb tremor measurement system), **R. Szabatin**, Docent (supervisor), (5).
- [BSc13] Łukasz Gąska: *“Generator sygnału o liniowo modulowanej częstotliwości dla systemu radiowego FM-CW”* (Signal generator with linear frequency sweep used by FM-CW radar system), Assist. Prof. **D. Gryglewski** (supervisor), (5).
- [BSc14] Tomasz Grochowski: *“Analogowy multieffekt gitarowy”* (Analog guitar multieffect), Prof. **Z. Kulka** (supervisor), (5).

TITLES AND DEGREES AWARDED

- [BSc15] Marcin Jakubowski: *"Przenośny aparat EKG"* (Mobile ECG), Assist. Prof. **M. Kazubek** (supervisor), (5).
- [BSc16] Kamil Janeczek: *"Odbiór sygnału DGPS"* (A reception of DGPS signal), Assist. Prof. **K. Czerwiński** (supervisor), (4).
- [BSc17] Łukasz Kabala: *"System rozpoznawania ręcznie pisanych cyfr z wykorzystaniem deskryptorów kształtu MPEG-7"* (Handwritten digits recognition system based on MPEG-7 shape descriptors), Assist. Prof. **G. Galiński** (supervisor), (4.5).
- [BSc18] Kamil Kliczbór: *"Oprogramowanie czujnika sił komórkowych 'cellforce' w technologii NET"* ("Cellforce" cellular force sensor developed using NET framework), Assist. Prof. **W. Smolik** (supervisor), (5).
- [BSc19] Tomasz Kilian: *"Ogranicznik mikrofalowy dla częstotliwości 5,8 GHz"* (Microwave diode limiter for frequency 5.8 GHz), Assist. Prof. **W. Wojtasiak** (supervisor), (4).
- [BSc20] Rafał Liszewski: *"Program do czasowej analizy EKG wysokiej rozdzielczości"* (An application for a time method of analysis high-resolution ECG signal), Assist. Prof. **B. Konarzewski** (supervisor), (4).
- [BSc21] Bogumiła Lusawa (Faculty of Environmental Engineering): *"Kryteria oceny hałasu w środowisku"* (Criteria of the environmental noise assessment), Assist. Prof. **E. Kotarbińska** (supervisor), (4.5).
- [BSc22] Marlena Lutostańska: *"Telemetryczny system do pomiaru utlenowania organizmu"* (Telemetric system for measuring oxygen level in human organism), Senior Lecturer **T. Jamrógielwicz** (supervisor), (5).
- [BSc23] Robert Molęda: *"Two way closed-box loud-speaker system – project, computer simulations and testing"*, Assist. Prof. **A. Leszczyński** (supervisor), (4), English-medium studies.
- [BSc24] Kiu Ngin Kar: *"Multimedia file conversion"*, Assist. Prof. **A. Buchowicz** (supervisor), (3,5), studies in English.
- [BSc25] Adam Nowak: *"Metody obrazowania badań scyntygraficznych z wykorzystaniem histogramów"* (The representation methods of scintigram studies with the use of histograms), **P. Brzeski**, Docent (supervisor), (5).
- [BSc26] Katarzyna Ochnik: *"Telemetryczny system do pomiaru sygnału EKG"* (Telemetric system for ECG measurement), Assist. Prof. **G. Domański** (supervisor), (4.5).
- [BSc27] Grzegorz Orzech: *"Realizacja sprzętowa odtwarzacza MP3"* (Hardware implementation of MP3 player), Prof. **Z. Kulka** (supervisor), (5).
- [BSc28] Krzysztof Pastuszyński: *"Inteligentna przeglądarka obrazów z zastosowaniem deskryptorów standardu MPEG-7"* (Intelligent image browser with MPEG-7 visual descriptors), Assist. Prof. **G. Galiński** (supervisor), (4.5).
- [BSc29] Maria Peńsko: *"Akustyka pomieszczeń do słuchania mowy"* (Acoustics of rooms for speech listening), Assist. Prof. **M. Tajchert** (supervisor), (5).
- [BSc30] Anna Piątkowska: *"EKG matki i płodu"* (Maternal and fetal ECG), Assist. Prof. **B. Konarzewski** (supervisor), (4).
- [BSc31] Mikołaj Podbielski: *"Analizator warstwy makrobloków strumienia H.265/AVC"* (H.264/AVC streams analyser), Assist. Prof. **G. Galiński** (supervisor), (5).
- [BSc32] Marcin Polski: *"Automatyczny system pozycjonowania kamery w chirurgii małoinwazyjnej"* (Automatic camera positioning in minimal invasive surgery), Prof. **K. Zaremba** (supervisor), (5).
- [BSc33] Karol Rogowski: *"Dobór ochronników słuchu do wielkości charakteryzujących hałas z uwzględnieniem wymagań dotyczących zrozumiałości mowy"* (Selection of hearing protectors according to their attenuation and speech intelligibility), Assist. Prof. **E. Kotarbińska** (supervisor), (5).
- [BSc34] Jakub Rosiński: *"Stanowisko do pomiaru modulacji analogowych"* (Station for measurement of analog modulated signals), Senior Lecturer **H. Chaciński** (supervisor), (4.5).
- [BSc35] Nabil Salih: *"Neural networks as an analytical tool for estimating of wavelenght power and noise in DWDM systems by applying a feed-forward neural network procedure"*, Assist. Prof. **A. Miękina** (supervisor), (4.5), studies in English.
- [BSc36] Maher Sharifi: *"Testing of software procedure for estimation of the parameters of the communication channels in an optical telecommunication link (DWDM system)"*, Assist. Prof. **A. Miękina** (supervisor), (3), studies in English.
- [BSc37] Piotr Sitarz: *"Aplikacja kontrolująca parametry karty bezprzewodowej WLAN"* (Application controlling the parameters of the wireless LAN card), Prof. **J. Modelski** (supervisor), (5).
- [BSc38] Michał Sobieszek: *"Rozproszony system do pomiarów klimatycznych"* (Distributed climate measurement system), Assist. Prof. **R. Łukaszewski** (supervisor), (5).
- [BSc39] Piotr Stajura: *"Komputerowy kurs nauki polskiego języka migowego"* (The computer course of the Polish sign language), **T. Kosiło**, Docent (supervisor), (5).
- [BSc40] Maciej Stefaniak: *"Wzmacniacz niskoszumowy"* (Low noise amplifier), Assist. Prof. **D. Gryglewski** (supervisor), (5).
- [BSc41] Marcin Sulej: *"Aplikacja do generowania i badania właściwości sygnałów losowych czasu dyskretnego"* (Application for generating and researching the properties of discrete time random

- signals), Assist. Prof. **K. Snopek** (supervisor), (5).
- [BSc42] Piotr Szczepaniuk: *"Prototyp wtyczkowego systemu obliczania deskryptorów standardu MPEG-7"* (Prototype of plug-in system to calculate MPEG-7 visual descriptors), Assist. Prof. **K. Ignasiak** (supervisor), (5).
- [BSc43] Piotr Szewczyk: *"Układ do pomiaru przebytej drogi z wykorzystaniem akcelerometru"* (Route measuring device based on accelerometer), Assist. Prof. **T. Buczkowski** (supervisor), (5).
- [BSc44] Paweł Szkup: *"Przeglądarka grafiki z możliwością wyszukiwania obrazów na podstawie deskryptorów standardu MPEG-7"* (Image viewer with possibility of searching images based on MPEG-7 descriptors), Assist. Prof. **K. Ignasiak** (supervisor), (3,5).
- [BSc45] Krzysztof Śliwak: *"Analiza systemów głośnikowych Line Array"* (The analysis of line array loudspeaker systems), Assist. Prof. **A. Leszczyński** (supervisor), (4,5).
- [BSc46] Piotr Tamila: *"Inteligentny, osobisty system nawigacji satelitarnej. Układ do pomiaru przebytej drogi z wykorzystaniem sensora myszy optycznej"* (Personal intelligent satellite navigation system device for measuring covered distance using optical mouse sensor), Assist. Prof. **T. Buczkowski** (supervisor), (5).
- [BSc47] Agnieszka Tokarska: *"Stanowisko komputerowe do pomiarów psychoakustycznych dla potrzeb dydaktycznych"* (A computer workstation for psychoacoustical measurements in didactics), Assoc. Prof. **J. Żera** (supervisor), (5).
- [BSc48] Dariusz Wierzbicki: *"Kompas cyfrowy w zastosowaniu dla osób niewidomych"* (Digital compass for the blind pedestrians), Assist. Prof. **T. Buczkowski** (supervisor), (5).
- [BSc49] Łukasz Wiśniewski: *"Akwizycja danych scyntygraficznych"* (Scintigraphic data acquisition), **R. Szabatin**, Docent (supervisor), (5).
- [BSc50] Przemysław Wituszyński: *"Zanurzanie obiektów graficznych w sieciach naturalnych"* (Embedding virtual objects in real series), Prof. **W. Skarbek** (supervisor), (5).
- [BSc51] Tomasz Włostowski: *"Foniczny przetwornik analogowo-cyfrowy do studia nagraniowego"* (Audio analog-to-digital converter for use in recording studio), Prof. **Z. Kulka** (supervisor), (5).
- [BSc52] Marcin Zapolski: *"Platforma sprzętowa dla bezprzewodowego systemu domowej automatyki"* (Hardware platform for a wireless home automation system), Assist. Prof. **W. Kazubski** (supervisor), (5).
- [BSc53] Marcin Zaremba: *"Przenośne urządzenie do monitorowania stanu układu krążenia"* (Portable device for monitoring of the cardiovascular system state), Assist. Prof. **G. Domański** (supervisor), (5).
- ### 5.4 B.Sc. Evening Studies on Radiocommunications – B.Sc. Degrees
- [BSc54] Krzysztof Czop: *"Konwerter łączy RS-232C na USB"* (RS-232C USB), Senior Lecturer **H. Chaciński** (supervisor), (4).
- [BSc55] Łukasz Jabłoński: *"Rezonansowa przetwornica napięcia stałego"* (Resonance dc/dc converter), Assist. Prof. **M. Mikołajewski** (supervisor), (5).
- [BSc56] Michał Kajczuk: *"Aplikacja integrująca kanały sprzedaży elektronicznej"* (E-commerce integrator application), Assist. Prof. **K. Ignasiak** (supervisor), (5).
- [BSc57] Przemysław Paszkowski: *"Filtr przeciwzakłóceńowy do zasilacza impulsowego"* (Filtering conducted interference signals generated by a switch-mode power supply), Assist. Prof. **M. Mikołajewski** (supervisor), (4,5).
- [BSc58] Marcin Pietrzak: *"Rezonansowy wzmacniacz mocy klasy F"* (Class-F resonance power amplifier), Assist. Prof. **J. Modzelewski** (supervisor), (5).
- [BSc59] Michał Religa: *"Stacja pogodowa"* (Weather station), Senior Lecturer **H. Chaciński** (supervisor), (4,5).
- [BSc59a] Piotr Sajdak: *"Symulacja toru transmisji danych z modulacją GMSK w środowisku MATLAB"* (Simulation of data transmission with GMSK modulation in MATLAB environment), Assist. Prof. **K. Radecki** (supervisor), (5).
- [BSc60] Andrzej Tukaj: *"Laboratoryjny układ do badań własności transmisji FSK"* (The laboratory system for the FSK transmission property research), Assist. Prof. **K. Radecki** (supervisor), (4,5).
- [BSc61] Michał Witkowski: *"Syntezer do konwertera częstotliwości na pasmo WLAN"* (Frequency synthesizer for converter for WLAN band), Assist. Prof. **D. Gryglewski** (supervisor), (4,5).
- [BSc62] Mateusz Ziętek: *"Komunikator GSM dla systemów alarmowych"* (GSM communicator for alarm systems), Assist. Prof. **W. Smolik** (supervisor), (3,5).
- [BSc63] Piotr Zadroga: *"Opracowanie komputerowego interfejsu użytkownika spektrometru USB 2000"* (Design of a graphical user's interface for the spectrometer USB 2000), Assist. Prof. **A. Miękina** (supervisor), (5).
- ### 5.5 M.Sc. Evening Studies on Radiocommunications – M.Sc. Degrees
- [MSc76] Wojciech Kucharski: *"Analiza rozwiązań cyfrowego systemu radiokomunikacyjnego dla miasta stołecznego Warszawa"* (Solutions analysis for digital radio communication system for the Warsaw City), **T. Kosiło**, Docent (supervisor), (5).

TITLES AND DEGREES AWARDED

[MSc77] Paweł Szczepski: *"Mikroprocesorowa stacja meteorologiczna"* (Microprocessor meteorology station), Assist. Prof. **G. Domański** (supervisor), (5).

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6.4 Abstracts and Posters

- [Pub174] M. Bielecki, P. Bogorodzki, I. Szatkowska, A. Pilaciński, L. Gawryś, L. Kaczmarek, A. Friedman, J. Sienkiewicz, R. Kuliński, R. Andrysiak, L. Królicki: "A Multi-subject Group Comparisons Toolbox for DTI Data - a Validation Study on Parkinson's Disease", *Proc. ESMRMB 25th Annual Meeting* (Valencia, Spain, Oct. 2-4, 2008), 1 pp.
- [Pub175] D. Czekaj, Y. Yashchyshyn: "Possibilities of Application of Ferroelectric Thin Films in Microwave Electronics", *Proc. IX Polish-Ukrainian Meeting and XXIX International School on Ferroelectrics Physics*, (Kraków, Poland, 14-18 Sept. 2008), 1 pp.

- [Pub176] S. Jankowski, Z. Szymański, E. Piątkowska-Janko: "Semi-supervised Least-squares Support Vector Classifier for Morphological Analysis of Electrocardiograms", *Proc. 10th Experimental Chaos Conference* (Catania, Italy, Jun. 3-6, 2008), 1 pp.
- [Pub177] S. Jankowski, Z. Szymanski, M. Raczyk, E. Piątkowska-Janko, A. Oręziak: "Pertinent Signal-averaged ECG Parameters Selection for Recognition of Sustained Ventricular Tachycardia", *Proc. XXXVth International Congress on Electrocardiology, 49th International Symposium on Vectorcardiology, 7th International Symposium on Comparative Electrocardiology* (St. Petersburg, Russia, Sept. 18-21, 2008), 1 pp.
- [Pub178] A. Malinowska, A. Szybińska, T. Rubel, A. Wysłouch-Cieszyńska, M. Dadlez: "Application of IEF-LC-MS Method in Analysis of Synaptosomes from Mouse Models of Alzheimer's Disease", *Proc. First European Synapse Meeting* (Bordeaux, France, Mar. 26-28, 2008), 1 p.
- [Pub179] A. Malinowska, A. Szybińska, T. Rubel, A. Wysłouch-Cieszyńska, M. Dadlez: "Qualitative and Quantitative Proteomic profiling of Synaptosomes from Mouse Models of Alzheimer's Disease", *Proc. 8th Siena Meeting from Genome to Proteome: Integration and Proteome Completion* (Siena, Italy, Aug. 31-Sept. 4, 2008), 1 pp.
- [Pub180] W. Obrębski, P. Bogorodzki, M. Wagner, E. Piątkowska-Janko: "Monitoring Hand Activity during fMRI Experiment - a MR Compatible Glove", *Proc. ESMRMB 25th Annual Meeting* (Valencia, Spain, Oct. 2-4, 2008), 1 pp.
- [Pub181] A. Przelaskowski: "Adaptive Paradigm of Lossless Compression for Medical Images", *Proc. 14th Nordic-Baltic Conference on Biomedical Engineering and Medical Physics* (Riga, Latvia, Jun. 16-20, 2008), p. 220.
- [Pub182] R. Slapa, K. Szopiński, J. Słowińska - Szrednicka, C. Mróz, A. Przelaskowski, W. Jakubowski: "Three-dimensional Ultrasound Could be Included in Thyroid Cancer Databases", *Ultrasound in Medicine*, (2008), 1 pp.
- [Pub183] M. Ziembicki, A. Nawrot, K. Klimaszewski, P. Żabowski-Żychowicz, M. Dziewiecki: "Construction and Performance of a Scintillating Fiber Detector", *IEEE 2008 Nuclear Science Symposium, Medical Imaging Conference and 16th Room Temperature Semiconductor Detector Workshop* (Dresden, Germany, Oct. 21, 2008), poster.
- [Pub184] T. Buczkowski: "Problemy z odpadowymi płytami kompaktowymi, część 1" (Compact Discs with Wastes), *Radioelektronik Audio-HiFi-Video*, no. 2 (2008), pp. 16-17.
- [Pub185] T. Buczkowski: "Problemy z odpadowymi płytami kompaktowymi, część 2" (Compact Discs with Wastes), *Radioelektronik Audio-HiFi-Video*, no. 2 (2008), pp. 12-13.
- [Pub186] T. Buczkowski: "Problemy z odpadowymi płytami kompaktowymi, część 3 (Compact Discs with Wastes), *Radioelektronik Audio-HiFi-Video*, no. 4 (2008), pp. 20-21.
- [Pub187] T. Buczkowski: "Recykling płyt kompaktowych (CD Recycling), *Radioelektronik Audio-HiFi-Video*, no. 7 (2008), pp. 17-19.
- [Pub188] J. Modelski: "Czy nadszedł czas na telewizję mobilną w Polsce?" (Is this a Time for the Mobile Television in Poland?), *INFOTEL*, no. 3 (2008), pp. 58-61.
- [Pub189] J. Modelski, T. Kosiło, T. Keller: "Usługi multimedialne w transporcie publicznym" (Multimedia Services in Public Transport), *Transport i Komunikacja*, no. 4 (2008), pp. 18-22.
- [Pub190] R. Z. Morawski: "Wino, oliwa...i spektrometria" (Wine, Olive... and Spectrometry), *Zdrowie Kobiety*, no. 2 (2008), pp. 28-34.
- [Pub191] R. Z. Morawski: "Wino, oliwa...i spektrometria" (Wine, Olive... and Spectrometry), *Diagnostyka*, no. 1(2) (2008), pp. 32-36.
- [Pub192] D. Radomski: "Prokreacja widziana okiem biocybernetyka" (Human Reproduction Seen by Biocybernetician's Eye), in: *Inżynieria biomedyczna: księga współczesnej wiedzy tajemnej w wersji przystępnej i przyjemnej* (Bioengineering – a Book of Present, Secret Knowledge in Accesible and Nice Version), R. Tadeusiewicz (ed.), AGH Uczelniane Wydawnictwo Naukowo-Dydaktyczne (Kraków, 2008), 12 pp, on CD-ROM.
- [Pub193] R. Rudowski, K. Broczek, T. Buczkowski, M. Karlińska, G. Maśloch, B. Opalka, R. Rzepka, K. Wieczorowska-Tobis, M. Zarsz-Andrzejewska: "Uwarunkowania realizacji programu badawczo-rozwojowego Ambient Assisted Living (AAL) w Polsce - komfortowe funkcjonowanie osób starszych w społeczeństwie infomacyjnym" (Conditions for the Realisation of the Ambient Assisted Living (AAL) R&D Program in Poland – Comfortable Participation of the Elderly in the Information Society), expert opinion commissioned by the Minister of Science and Higher Education, 227 pp., (Warsaw, December 2007) published – January 2008.
- [Pub194] Y. Yashchyshyn: "Antenna Systems with Reconfigurable Aperture", *Proc. 18th International Travelling Summer School on Microwaves and Lightwaves* (Prague, Czech Republic, Jul. 5-11, 2008), pp. 409-442.

6.5 Other publications

- [Pub184] T. Buczkowski: "Problemy z odpadowymi płytami kompaktowymi, część 1" (Compact Discs with Wastes), *Radioelektronik Audio-HiFi-Video*, no. 2 (2008), pp. 16-17.
- [Pub185] T. Buczkowski: "Problemy z odpadowymi płytami kompaktowymi, część 2" (Compact

6.6 Books and special issues edited by the staff

- [Pub195] W. Winiecki, R. Duro, U. Großmann: (Guest editors) "Intelligent Data Acquisition and Advanced Computing Systems 2007" *International Journal of Computing*, vol. 7, issue 2 (2008).

7 RESEARCH REPORTS

- [Rep1] T. Adamski, W. Winiecki, R. Łukaszewski, P. Bobiński, T. Owczarek, P. Bilski, J. Olszyna: *"Bezpieczeństwo sieci typu RSPS o asymetrycznych zasobach obliczeniowych"* (Security of Distributed Measurement and Control Systems with Asymmetric Computational Resources), Final report for the Dean grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2008.
- [Rep2] P. Bajurko, Y. Yashchyshyn, M. Bury, K. Kurek: *"Deliverable D16, Optimised antennas and antenna arrays"*, Final report for the European VI Framework Programme RESOLUTION Project, <http://www2.ife.ee.ethz.ch/RESOLUTION/>, WUT Warsaw, Nov. 2008.
- [Rep3] P. Bogorodzki, I. Wawer, M. Pisklak, W. Szeszkowski, J. Krupka, J. Piotrowski, J. Skulski, E. Piątkowska-Janko, M. Kazubek, W. Obrębski, T. Jamrógiewicz: *"Projekt i badania układów hyperpolaryzacji w zastosowaniu do obrazowania techniką MR"* (Instrumentation for Hyperpolarized MRI Contrast Media), Final report for the Dean grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2008.
- [Rep4] A. Buchowicz, W. Skarbek, G. Pastuszak, G. Galiński, K. Wnukowicz, S. Badura: *"Algoritmy adaptacyjnego transkodowania cyfrowego sygnału wizyjnego i ich implementacja sprzętowa"* (Algorithms for Adaptive Video Transcoding and their Hardware Implementation), Final report for the research grant, Warsaw, Jun. 2008.
- [Rep5] J. Cichocki, R. Michnowski, K. Radecki, W. Kielek (em.), S. Żmudzin, P. Makal, P. Ziętek: *"Ultraszerokopasmowe układy nadawcze do systemów lokalizacyjnych"* (UWB Transmitters for Localization System), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Nov. 2008.
- [Rep6] D. Gryglewski, W. Wojtasiak, M. Lubiejewski: *"Wykonanie 5 szt. diplexerów 3,5 GHz dla systemu IRT"* (Construction of Five 3.5 GHz Diplexers for IRT System), Final report for Ericson Ltd., Feb. 2008.
- [Rep7] W. Gwarek, T. Morawski, M. Celuch, P. Miazga, W. Wojtasiak, J. Zborowska, R. Michnowski, K. Robaczyński, P. Kopyt, J. Rudnicki, M. Lubiejewski: *"Metody symulacji elektromagnetycznych i projektowania torów nadawczych dla systemów radiokomunikacyjnych"* (Methods of Electromagnetic Simulations and Design of Transmitters for Radiocommunication Systems), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Nov. 2008.
- [Rep8] K. Ignasiak, W. Skarbek, G. Galiński, A. Buchowicz, G. Pastuszak, S. Badura, M. Leszczyński, J. Naruniec, A. Nowakowski, M. Tomaszewski: *"Audiowizualne sieciowe systemy hybrydowe"* (Audiovisual Network Hybrid Systems), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Nov. 2008.
- [Rep9] T. Kosiło, S. Hahn, J. Wojciechowski, T. Buczkowski, K. Czerwiński, J. Jarkowski, W. Kazubski, K. Snopek, Z. Walczak: *"Sygnały i systemy radiokomunikacyjne"* (Radiocommunication Signals and Systems), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Nov. 2008.
- [Rep10] 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, Nov. 2008.
- [Rep11] Z. Kulka, P. Nykiel: *"Rejestracja sygnałów dźwiękowych w komorze bezchłowej"* (Recordings of Noise Signals in the Anechoic Chamber), Final report for FORTE Ltd. Company, Mar. 2008.
- [Rep12] K. Kurek, M. Stolarski, A. Cichocki: *"Satelitarny moduł komunikacji pokładowej"* (Communications System for Pico-Satellite), Final report for the Rector grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2008.
- [Rep13] R. Z. Morawski, A. Miękina, A. Podgórski: *"Metodyka interpretacji danych pomiarowych"* (Methodology for Interpretation of Measurement Data), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Nov. 2008.
- [Rep14] J. Modelski, Y. Yashchyshyn, T. Keller, K. Kurek, P. Bajurko, M. Bury, D. Kolmas, S. Kozłowski, A. Kurek, M. Stolarski, R. Szumny, P. Ziętek, M. Dąbrowski, K. Bryłka: *"Systemy radiokomunikacyjne przyszłych generacji"* (Radiocommunication Systems of the Future Generation), Final report for the Foundation for Polish Science (Fundacja na rzecz Nauki Polskiej), Warsaw, Jun. 2008.
- [Rep15] J. Modzelewski, W. Kazubski, M. Mikołajewski, H. Chaciński: *"Zastosowanie impulsowych zasilaczy sterowanych w układach modulatorów amplitudy o dużej mocy wyjściowej"* (Applications of Switch-mode Controllable Voltage Regulators in High-power Amplitude Modulators), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Nov. 2008.
- [Rep16] E. Piątkowska-Janko, P. Chmielewski, P. Kamiński, W. Obrębski, A. M. Laskowski, B. Radzik: *"Wdrożenie systemu monitoringu kardiologicznego oraz wykonanie krótkiej serii telemetrycznych aparatów EKG"* (Implementation of Cardiological Monitoring System and Execution of Short Series of Telemetric ECG), Final report

- for the Rector grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2008.
- [Rep17] E. Piątkowska-Janko, S. Jankowski, A. Oręziak, L. Wyrwicz, Z. Szymański, J. Będkowski, P. Danielewicz, T. Rubel: *"Optymalizacja klasyfikatorów transdukcyjnych na podstawie testów oceny krzyżowej i zastosowania w kardiologii i bioinformatyce"* (Transductive Classifiers Optimization by Means of Cross-Estimation Tests and Application in Cardiology and Bioinformatics), Final report for the Rector grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2008.
- [Rep18] E. Piątkowska-Janko: *"Wykonanie i sprzedaż zestawu urządzeń do badań czynnościowych fMRI"* (Construction and Sale the Tools Designed for Brain Imaging (fMRI)), Final report for Siemens Ltd. Company, Oct. 2008.
- [Rep19] D. Radomski, A. Przelaskowski, M. Ławryńczuk, P. Marusak, P. Tatjewski: *"Badanie wybranych algorytmów regulacji predykcyjnej w dawkowaniu insuliny u chorych na cukrzycę"* (Investigation of Selected Algorithms for Prediction Regulation in Insuline Dosis for Diabetics), Final report for the Dean grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2008.
- [Rep20] W. Skarbek, K. Wnukowicz: *"Opracowanie technologii i oprogramowania dla Photo Player and Advanced Video Player Technologies"* (Development of Photo Player and Advanced Video Player Technologies), Final report for Mitsubishi Electric Information Technology Center European B.V, Mar. 2008.
- [Rep21] R. Szabatin, P. Brzeski, W. Smolik, T. Olszewski, J. Mirkowski, A. Płaskowski, P. Czarnecki: *"Wielopłaszczyznowy elektryczny procesowy tomograf pojemnościowy o wysokiej rozdzielczości pozycyjnej"* (Multi-plane Capacitance Tomograph for Flow Speed Measurement), Final report for the Rector grant, University Research Program, Institute of Radioelectronics, WUT, Warsaw, Dec. 2008.
- [Rep22] W. Winiński, K. Mroczek, P. Bilski, R. Łukaszewski, T. Daniluk: *"Nowoczesne metody projektowania komputerowych systemów pomiarowych"* (Modern Methods of Computer Measuring Systems Designing), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Nov. 2008.
- [Rep23] W. Winiński, E. Kotarbińska: *"Weryfikacja metody VeriPRO badania tłumienia dźwięku wkładek przeciwhałasowych w warunkach laboratoryjnych"*, (Laboratory Verification of the VeriPro Metod for Testing Ear-plugs Attenuation), Final report for the Rector grant, Institute of Radioelectronics, WUT, Warsaw, Dec. 2008.
- [Rep24] Y. Yashchyshyn, M. Dąbrowski, K. Bryłka, J. Modelski, K. Kurek, T. Keller, K. Derzakowski: *"Metody synchronizacji odbiorników radiofonii oraz telewizji cyfrowej"* (Methods of Synchronization Broadcasting and Digital Television Receivers), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Nov. 2008.
- [Rep25] K. Zaremba, P. Bogorodzki, P. Brzeski, G. Domański, T. Jamrógiwicz, M. Kazubek, B. Konarzewski, J. Marzec, T. Olszewski, Z. Pawłowski, E. Piątkowska-Janko, A. Przelaskowski, W. Smolik, R. Szabatin, P. Bargieł, P. Boniński, R. Kurjata, M. Orzechowski, A. Trybuła, T. Wolak, A. Wróblewska: *"Nowoczesne techniki elektroniki jądrowej i medycznej"* (Modern Techniques in Nuclear and Medical Electronics), Final report for the statutory grant, Institute of Radioelectronics, WUT, Warsaw, Nov. 2008.
- [Rep26] K. Zaremba, M. Ziembicki, M. Dziewiecki, R. Kurjata, G. Domański, B. Konarzewski: *"Projekt oraz wykonanie układu interfejsu CC-link"* (Project and CC-link Interface Construction), Final report for Northen Design Electronics, Bradford, UK, Warsaw, Mar. 2008.
- [Rep27] K. Zaremba, M. Ziembicki, M. Dziewiecki, R. Kurjata, J. Marzec: *"Opracowanie i wykonanie układów elektronicznych do detektorów radiologii, projekt badawczy "Nowe techniki detekcji neutronów w zastosowaniach przemysłowych i kontroli granic"* (New Neutron Detection Techniques in Industrial and Customs Applications), Final report for Andrzej Soltan Institute for Nuclear Studies, Warsaw, Mar. 2008.

8 PATENTS

- [Pat1] A. Andrushchak, O. Syrotynsky, N. Andrushchak, Y. Yaschyshyn: *“Rotating interferometer for measurement of the isotropic and anisotropic dielectric materials at centimeter and millimeter range of wavelength”*, Ukrainian Patent No. 35224, Sept. 10, 2008.
- [Pat2] P. Kopyt, P. Węgrzyniak, M. Krok, W. Gwarek: *“Zasilane zdalnie urządzenie transmisji danych pomiarowych”* (Remotely Powered Device for Transmission of Measurement Data), Patent Application, P-384303, Jan. 22, 2008.
- [Pat3] R. Morawski, A. Miękina, B. M. Slima, A. Barwicz: *“Method of interpreting spectrometric data”*, Canadian Patent CA 2237944, Jan. 29, 2008.

9 SCIENTIFIC EVENTS

9.1 Scientific events co-organized by the Institute

- [Con1] *Microwave and Radar Week in Poland, Wrocław*, (Wrocław, Poland, May 21-23, 2008) with J. Modelski as the general chair, included its main event: MIKON 2008, *17th International Conference on Microwaves, Radar and Wireless Communications* (Wrocław, Poland, May 19-21, 2008) with W. Gwarek – TPC co-chair and T. Morawski – TPC member. More than 20 faculty members and students of the Institute participated in the Conference and contributed to its Technical Program.
- [Con2] *European Conference: Medical Physics and Engineering 110 Years after the Discovery of Polonium and Radium* (Kraków, Poland, Sept. 17-21, 2008), K. Zaremba (head of the Warsaw Branch of Polish Society of Medical Physics, member of the Scientific and Organizing Committee).

9.2 International scientific events

- [Con3] *IEEE Radio and Wireless Symposium – RWS 2008* (Orlando, USA, Jan. 19-25, 2008), J. Modelski (MTT-S president's "Welcome Address" session opening speech, member of the Program Committee), R. Szumny (speaker).
- [Con4] *9th International Conference "Modern Problems of Radio Engineering, Telecommunications and Computer science: TCSET 2008"* (Lviv, Ukraine, Feb. 19-23, 2008), Y. Yashchyshyn (speaker).
- [Con5] *10th Seminar: Computer Modeling & Microwave Power Engineering* (Modena, Italy, Feb. 27-Mar. 5, 2008), W. Gwarek (participant).
- [Con6] *Symposium ACES* (Worcester, USA, Mar. 27-Apr. 6, 2008), M. Celuch (speaker).
- [Con7] *International Conference on Acoustics, Speech and Signal Processing* (Las Vegas, USA, Mar. 29-Apr. 4, 2008), J. Wojciechowski (participant).
- [Con8] *IEEE Computer Society Annual Symposium on SVLSI* (Montpellier, France, Apr. 6-10, 2008), G. Pastuszek (participant).
- [Con9] *European Wireless Technology Conference: EuMA* (the Hague, the Netherlands, Apr. 11-13, 2008), J. Modelski (member of the Program Committee).
- [Con10] *The 14th IEEE Mediterranean Electrotechnical Conference: MELECON 2008* (Ajaccio, France, May 3-5, 2008), J. Modelski (member of the International Scientific Committee), K. Brytka (speaker).
- [Con11] *2008 IEEE International Instrumentation & Measurement Technology Conference – PMTC* (Victoria, Canada, May 12-15, 2008), W. Winiński (speaker).

- [Con12] *17th International Conference on Microwaves, Radar and Wireless Communications: MIKON 2008* (Wrocław, Poland, May 19-21, 2008), J. Modelski (MTT-S president's "Welcome Address" session opening speech), W. Gwarek (co-chairman of the Technical Programme Committee), T. Morawski (member of the Technical Programme Committee), M. Tajchert, M. Celuch, K. Kurek, P. Kopyt, M. Mikołajewski, P. Miazga, M. Mikołajewski, M. Sypniewski, Y. Yashchyshyn, R. Bajurko, M. Bury, S. Kozłowski, D. Rosołowski, M. Sołtyś, B. Salski, R. Szumny (speakers).
- [Con13] *9th International Radar Symposium* (Wrocław, Poland, May 21-23, 2008), J. Modelski (MTT-S president's "Welcome Address" session opening speech).
- [Con14] *30th ESA Antenna Workshop on Antennas for Earth Observation, Science, Telecommunication and Navigation Space Missions* (Noordwijk, the Netherlands, May 27-30, 2008), Y. Yashchyshyn (Region 9 delegate in the European AAP Board).
- [Con15] *IEEE 2008 International Microwave Symposium* (Atlanta, Georgia, USA, Jun. 15-20, 2008), J. Modelski (MTT-S president's "Welcome Address" session opening speech, member of Technical Programme Committee, IEEE MTT-S Board), M. Celuch (member of the Scientific Committee, vice-president AES/AP/MTT Joint Chapter, Poland Section of IEEE, speaker).
- [Con16] *IEEE International Conference on Information Technologies in Biomedicine: ITiB 2008* (Kamień Śląski, Poland, Jun. 16-18, 2008), A. Przelaskowski (session chair, speaker), D. Radomski, P. Boniński, R. Jóźwiak, G. Ostrek (speakers).
- [Con17] *14th Nordic-Baltic Conference on Biomedical Engineering and Medical Physics* (Riga, Latvia, Jun. 16-20, 2008), A. Przelaskowski, G. Ostrek (participant).
- [Con18] *9th International Conference on Artificial Intelligence and Soft Computing* (Zakopane, Poland, Jun. 22-26, 2008), A. Dominik (speaker).
- [Con19] *Acoustics 2008* (Paris, France, Jun. 29-Jul. 4, 2008), A. Młyńska (participant), E. Kozłowski (speaker).
- [Con20] *1st IEEE Region 8 International Conference on Computational Technologies in Electrical and Electronics Engineering: SIBIRCON 2008* (Novosibirsk, Russia, Jul. 21-25, 2008), J. Modelski (R8 director-elect "Welcome Address" session opening speech, Welcome Address", member of International Advisory Board).
- [Con21] *NIWeek 2008 Worldwide Virtual Instrumentation Conference* (Austin, USA, Aug. 2-8, 2008), W. Winiński (participant).

SCIENTIFIC EVENTS

- [Con22] *50th International Symposium: ELMAR 2008* (Zadar, Croatia, Sept. 10-13, 2008), M. Jędryka, K. Wnukowicz (participants).
- [Con23] *International IMEKO TC1&TC7 Joint Symposium* (Annecy, France, Sept. 3-5, 2008), R. Z. Morawski (invited keynote speaker).
- [Con24] *The 19th Wroclaw International Symposium and Exhibition on Electromagnetic Compatibility* (Hamburg, Germany, Sept. 8-12, 2008), J. Jarkowski (speaker).
- [Con25] *IMEKO TC19-TC23-TC24 Int. Conf. on Metrology of Environmental, Food and Nutritional Measurements* (Budapest, Hungary, Sept. 10-12, 2008), R. Z. Morawski, A. Latała (speakers).
- [Con26] *International Broadcasting Convention 2008* (Amsterdam, the Netherlands, Sept. 10-14, 2008), J. Jarkowski (participant).
- [Con27] *IEEE Second International Conference on Biometrics: Theory, Applications and Systems: BTAS 2008* (Washington DC, USA, Sept. 29-Oct. 1, 2008), J. Naruniec (participant).
- [Con28] *ESMRMB 25th Annual Meeting* (Valencia, Spain, Oct. 2-4, 2008), E. Piątkowska-Janko, P. Bogorodzki, W. Szeszkowski (participants).
- [Con29] *Mediterranean Microwave Symposium: MMS 2008* (Damascus, Syria, Oct. 14-16, 2008), J. Modelski (MTT-S president's "Welcome Address" session opening speech).
- [Con30] *19th International Trade Fair and Congress, Rehabilitation, Prevention, Integration, Care* (Düsseldorf, Germany, Oct. 15-18, 2008), T. Buczkowski (participant).
- [Con31] *IEEE 2008 Nuclear Science Symposium, Medical Imaging Conference and 16th Room Temperature Semiconductor Detector Workshop* (Dresden, Germany, Oct. 19-25, 2008), M. Ziembicki (participant).
- [Con32] *The Sixth International Conference on Rough Sets and Current Trends in Computing* (Arkon, USA, Oct. 22-25, 2008), M. Jędryka (participant).
- [Con33] *38th European Microwave Conference: EuMC 2008* (Amsterdam, the Netherlands, Oct. 28-31, 2008), J. Modelski (MTT-S president's "Welcome Address" session opening speech, member of the Program Committee, session chairman), Y. Yashchyshyn (session chairman, speaker).
- [Con34] *37th International Congress and Exposition on Noise Control Engineering: INTERNOISE 2008* (Shanghai, China, Oct. 24-30, 2008), A. Podgórski (speaker).
- [Con35] *Health Protection – Development of Medical Technologies* (Stockholm, Sweden, Oct. 29-31, 2008), P. Bogorodzki (participant).
- [Con36] *International Conference on Computer Vision and Graphics: ICCVG 2008* (Warsaw, Poland, Nov. 10-12, 2008), A. Przelaskowski, G. Ostrek, J. Jóźwiak (participants).
- [Con37] *Electronica 2008, New Munich Trade Fair Centre* (Münich, Germany, Nov. 11-14, 2008), T. Buczkowski (participant).
- [Con38] *Texas Instruments Design Forum, International Congress Center* (Münich, Germany, Nov. 12, 2008), T. Buczkowski (participant).
- [Con39] *IEEE TENCON 2008: Microwave Workshop* (Hyderabad, India, Nov. 18-21, 2008), J. Modelski (speaker).
- [Con40] *ICB Seminar on Variability in Biomedical Signals, International Centre of Biocybernetics, Polish Academy of Sciences* (Warsaw, Poland, Nov. 20-22, 2008), T. Buczkowski (participant).
- [Con41] *2008 Conference on Recent Advancements in Microwave Theory and Applications: Microwaves 2008* (Jaipur, India, Nov. 21-24, 2008), J. Modelski (MTT-S president's "Welcome Address" session opening speech) M. Celuch, W. Gwarek (speakers).
- [Con42] *Asia Pacific Microwave Conference: APMC 2008* (Hong-Kong, China, Dec. 16-19, 2008), J. Modelski (MTT-S president's "Welcome Address" session opening speech, member of the International Steering Committee).

9.3 National scientific events

- [Con43] *XXXVI Szkoła Zimowa Zwalczenia Zagrożeń Wibroakustycznych*, (XXXVI Winter School on Vibroacoustics) (Gliwice-Wisła, Poland, Feb. 25 – 29, 2008), E. Kotarbińska (speaker).
- [Con44] *Krajowa Konferencja Radiokomunikacji, Radiofonii i Telewizji – KKRRiT'2008* (National Conference on Radiocommunications, Broadcasting and Television), (Wrocław, Poland, Apr. 9-11, 2008), J. Modelski, W. Skarbek, J. Cichocki (session chairmen), A. Buchowicz, J. Jarkowski, W. Kazubski, T. Keller, J. Kołakowski, R. Michnowski, K. Snopek, Y. Yashchyshyn, R. Bajurko, M. Dąbrowski, M. Jędryka, M. Jakubowski, S. Kozłowski, J. Kosiński, A. Lewandowski, M. Leszczyński, P. Makal, J. Naruniec, P. Ziętek (speakers), R. Michnowski, Ł. Żukowski (participants).
- [Con45] *Seminarium "Lokalne problemy e-integracji w Polsce"* (Local Problems of e-Integration in Poland), (Warsaw, Poland, Apr. 23, 2008), T. Buczkowski (participant).
- [Con46] *XI Krajowa Konferencja Naukowa Reprogramowalne Układy Cyfrowe: RUC 2008* (XIth National Scientific Conference on Reprogrammable Digital Units), (Szczecin, Poland, May 15-16, 2008), G. Pastuszak (speaker).
- [Con47] *III Konferencja Naukowo-Techniczna: "Zintegrowany transport publiczny w obsłudze miast i regionów"* (Integrated Public Transport in Town

SCIENTIFIC EVENTS

- and Region Service), (Warsaw, Poland, May 16, 2008), J. Modelski (speaker), T. Kosiło, T. Keller (participants).
- [Con48] *VIII Szkoła-Konferencja: Metrologia Wspomagana Komputerowo* (VIIIth School - Conference: Computer-Aided Metrology), (Waplewo, Poland, May 27-30, 2008), W. Winiecki, P. Bobiński, R. Łukaszewski (speakers).
- [Con49] *VII Krajowa Konferencja Elektroniki: KKE 2008* (VIIth National Conference on Electronics), (Darłowo Wschodnie, Poland, Jun. 2-4, 2008), T. Morawski, D. Gryglewski, J. Modzelewski (speakers).
- [Con50] *Systemy Pomiarowe w Badaniach Naukowych i w Przemysle: SP'08* (Measuring Systems in Research and Industry), (Łagów, Jun. 18-20, 2008). W. Winiecki (member of the Scientific Committee, speaker), K. Zaremba (invited speaker), P. Bobiński, R. Łukaszewski (speakers).
- [Con51] *III Konferencja Naukowo-Techniczna Doktorantów i Młodych Naukowców: "Młodzi naukowcy wobec wyzwań współczesnej techniki"* (IIIrd Ph.D. Students' and Young Scientists Towards the Challenges of Contemporary Technology), (Warsaw, Poland, Sept. 22-24, 2008), P. Bajurko (participant).
- [Con52] *Committee on Space and Satellite Research, Polish Academy of Sciences*, lecture: "Directions of the Development of Satellite Communications" (Psary, Poland, Sept. 25, 2008), J. Modelski (speaker).
- [Con53] *IX Seminarium; Radiokomunikacja i Techniki Multimedialne* (IXth Seminar: Radiocommunications and Multimedia Technologies), (Warsaw, Poland, Dec. 3, 2008), J. Bełczewski, R. Głogowski, C. Jezierski, J. Kosiński, A. Lewandowski, K. Lis, P. Przybyszewska, Ł. Winiarski (speakers).

10 AWARDS AND DISTINCTIONS

State Medals

Marek Rusin, Ph.D.

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

Henryk Chaciński, M.Sc.

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

Award of the Minister of Health

Tymon Rubel, M.Sc.

Team award for the paper concerning research on molecular processes in Barrett esophagus.

Awards by International Organizations

Yevhen Yashchychshyn, Krzysztof Derzakowski, Józef Modelski

Main 2008 Prize of the European Microwave Association for new concept of the reconfigurable antenna, (Amsterdam, the Netherlands, Oct. 2008).

Awards by National Organizations

80th Anniversary of "Przegląd Telekomunikacyjny"

Stefan Hahn, Prof. D.Sc.

Individual award for the outstanding scientific achievements in telecommunications and radiocommunications.

Golden Antennas of "World of Telecommunications"

Józef Modelski, Prof. D.Sc., *Man of the Year 2008* – for promoting Poland in the world's engineering community.

Marek Rusin, Ph.D. *Man of the Year 2008* – for building regulation strategy in national telecommunication.

Golden Laurel of INFOTEL

Józef Modelski, Prof. D.Sc. - for developing new technologies and techniques

Awards of the Rector

Jacek Cichocki, Ph.D., Docent,

Jerzy Kołakowski, Ph.D.

Award for the book: *"UMTS system telefonii komórkowej trzeciej generacji"* (UMTS Third Generation Cellular System).

Roman Szabatin, Ph.D., Docent,

Tomasz Olszewski, M.Sc.,

Waldemar Smolik, Ph.D.,

Jacek Mirkowski, Ph.D.

Team award for elaboration of electrical capacitance tomograph ET3.

Piotr Bogorodzki, Ph.D.,

Ewa Piątkowska-Janko, Ph.D.,

Robert Kurjata, Ph.D.,

Tomasz Wolak, M.Sc.,

Mateusz Orzechowski, M.Sc.

Team award for development of methodology and instrumentation for Functional Magnetic Resonance Imaging (fMRI) of auditory cortex.

Award of students of the Faculty

"Golden Chalk" Award

Jerzy Kołakowski, Ph.D.

Awards of Foundation for the Development of Radiocommunication and Multimedia Technologies

Awards granted for the conference papers and posters

Jan Kosiński

The first award in the contest for the Young Scientists for the paper: *"Realizacja układów sterujących w ultraszerokopasmowym systemie lokalizacyjnym"* (Implementation of Control Modules in Ultrawideband Localization System), *Krajowa Konferencja Radiokomunikacji, Radiofonii i Telewizji* (National Conference on Radiocommunications, Broadcasting and Television), (Wrocław, Poland, Apr. 9-11, 2008).

Paweł Bajurko, M.Sc.

The second award in the contest for the Young Scientists for the paper: *"Antena planarna z kołową szczeliną"* (Planar Antenna with Circular Slot), *Krajowa Konferencja Radiokomunikacji, Radiofonii i Telewizji* (National Conference on Radiocommunications, Broadcasting and Television), (Wrocław, Poland, Apr. 9-11, 2008).

Adam Lewandowski

Distinguished award in the contest for the Young Scientists for the paper: *"Realizacja układów części analogowej ultraszerokopasmowego systemu lokalizacyjnego"* (Implementation of the Analog Modules of an Ultrawideband Positioning System), *Krajowa Konferencja Radiokomunikacji, Radiofonii i Telewizji* (National Conference on Radiocommunications, Broadcasting and Television), (Wrocław, Poland, Apr. 9-11, 2008).

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

For preparing Ph.D. thesis

Paweł Bajurko, M.Sc.,

Marek Bury, M.Sc.,

Sebastian Kozłowski, M.Sc.

For preparing M.Sc. thesis

Jan Bełczewski,

Grzegorz Brzuchalski,

Jarosław Budzisz,

Rafał Głogowski,

Jan Kosiński,

Adam Lewandowski,

Krzysztof Lis,

Paulina Przybyszewska,

Łukasz Winiarski.

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

SPECIFICATION	2004	2005	2006	2007	2008
academic staff [posts]					
total	61.89	61.58	61.08	60.5	64.5
tenured professors	3.4	3.4	2.75	4	5
professors	6.6	7.6	9	7	7
associate professor	3	2.5	2.5	2.5	1,5
assistant professors	42.5	42.25	41.5	39.5	40.75
docents	-	-	-	2	4
senior lecturers	4.83	4.83	4.83	4.5	4,5
assistants	1.5	1	0.5	1	1,75
Ph.D. Students [persons]					
total	43	38	44	34	43
regular, the third level studies	24	24	20	13	23
without scholarship	19	14	24	21	20
technical and administrative staff [posts]					
total	22.65	20.04	20.06.2009	18.1	18.25
R&D associates	11.15	8.9	11.6	8.6	8,25
administrative associates	8,50	8.5	6	6.5	7
librarian	1	1	1	1	1
service workers	2	2	2	2	2
Space [m ²]					
total	3069.6				
laboratories	1320.0				
library	81.1				
offices of academic staff	1355				
library resources					
books (volumes)	15133	15344	15501	15530	15785
books (titles)	8262	8353	8459	8488	8662
journals (subscriptions)	125	126	126	126	126
teaching activities					
basic courses	48	60	62	62	61
advanced courses	37	33	22	22	25
other courses	59	80	66	60	57
international course projects	1	6	1	4	1
research projects					
total	58	41	51	52	48
International	11	6	10	8	9
granted by Ministry	12	11	13	15	16
granted by the University	20	15	17	17	18
other	15	9	11	12	5
research projects budget					
PLN:	3 806 000	4 397 000	5 020 000	4 833 000	5 712 877
Euro:	228 000	331 000	323 000	495 000	211 000
titles and degrees awarded					
D.Sc. degree	2	-	1	-	-
Ph.D. degree	6	5	9	5	4
M.Sc. degree (regular studies + evening studies)	85	50	64+3	63+3	75+2
M.Sc. degree (studies in English)	-	-	1	1	-
B.Sc. degree (regular studies + evening studies)	58+54	51+14	68+10	55+16	47+10
B.Sc. degree (studies in English)	4	7	3	4	5
B.Sc. degree (distant learning)	-	-	2	1	1
publications					
total	222	224	235	229	194
sci.-tech. books and chapters in books	1	6	5	1	12
sci.-tech. papers in journals – total	52	65	61	82	92
JCR-ICI list		22	13	32	39
MSHE list		26	16	32	49
in other journals		17	32	18	4
sci.-tech. papers in conference proceedings	145	131	149	131	69
other publications	19	19	22	15	21
research reports	43	27	35	38	27
conferences attended by the staff	39	48	50	56	52

EXPLANATORY NOTE ON POLISH ACADEMIC AND PROFESSIONAL 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:

- *wykladowca*, 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*.