



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



ANNUAL REPORT

2000

Warsaw, March 2001

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From the Director

For the fifth time the Institute of Radioelectronics is presenting its Annual Report, and I have pleasure of saying an opening line. This seems a sufficient excuse, together with the better-known new millennium, to look back at our plans and achievements, and to summarise what we are about and what we are aiming at.

The Institute of Radioelectronics is about teaching and research. In that basic sense, it does not differ from other institutes of the Faculty. However, the Institute of Radioelectronics is also about diversity: diversity of pursued scientific subjects, diversity of engineering projects, diversity of laboratory bases, and diversity of offered courses. And in those aspects, it holds quite a unique position within the University.

For decades our staff members have been making significant contributions to the fields of electroacoustics and electromagnetics, nuclear and biomedical engineering, radiocommunications and television, signal processing and monitoring systems. However, recent years have brought such rapid progress in information, communication, and multimedia technologies worldwide, that one may wonder if it is at all possible for an Institute responsible for both research and teaching to embrace and follow all relevant developments in all the fields of interest.

Year 2000 was stimulating and successful, with several prestigious prizes and titles awarded to our long-standing members of staff as well as to those of more recent vintage. The most prestigious were: two IEEE Fellow Awards, and „Master of Technology 2000“, as well as two awards from the Minister of National Education. But also was the award for the best paper in international journal, and few awards from the conference papers being presented by Ph.D. students.

Committed as we are to scientific research, we consider good engineering equally relevant for our mission and goals; hence our sustained efforts to expand our laboratory bases. Modern laboratories are vital for experimental verification of research results, for the performance of projects, which often lead to prototype or short series equipment production, and last but not least, for offering hand-on experience to our students. Needless to say, our wishes in this regard extend far beyond our budget, and we therefore most gratefully acknowledge the generosity of our sponsors. Last year's donation of a new complete laboratory for Measurements in Radiocommunications by Hewlett-Packard has been followed by generous donation of a computerized tomograph by Central Clinical Hospital for the Ministry of Internal Affairs and Administration. In year 2000 was also set up the *Foundation for the Development of Radiocommunications and Multimedia Technologies*, supporting new research projects and awarded some outstanding achievements.

A broad area of scientific and practical experience facilitates a continuous development of our educational offer, which we aim to keep up to the expectations of our newcoming students and their future employers. In recent years, there has been a surge of interest in education on two focal subjects: Radio Frequency Engineering and Multimedia Technologies. The Institute of Radioelectronics, ready to accept a leading role in this regard, has consequently enjoyed an increasing popularity among the students. This is exemplified by an increasing number of M.Sc. (65) and B.Sc. (76) graduates, who in turn find themselves extremely popular on the commercial, industrial, and public job market.

The Institute offers courses at undergraduate, graduate and doctoral levels. Additionally, our programme of continuing education has proven extremely successful. Throughout year 2000 we have run 39 short courses and part-time studies for a number of dynamically developing Polish communication businesses, banks, and local and governmental organisations. This activity confirms our societal relevance.

Finally, there comes an issue of international relevance. Excellence in science and teaching is essential, but the will to undertake an industrial project with stiff deadlines and technical requirements is a different story. This year our decision has been to face the challenge. We have started from scratch and successfully performed two industrial projects, for Arris (USA) and Personal Chemistry (Sweden), in parallel with the on-going project for CERN. Suspicions melted on all sides, and perspectives for further contracts have been drawn.

This report summarises our activities and achievements, thus re-affirming our goals, our competence, and our relevance. We are deeply grateful to all those who identify with our goals; who sponsor and support our activities; and who are or will become our partners in the challenging research and teaching projects of the new millennium.

Warsaw, March 2001

Professor Józef Modelski, Ph.D., D.Sc.

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This Annual Report summaries the research activities of the Institute in 2000, as well as the teaching activities of the academic year 1999/2000

1. GENERAL INFORMATION

1.1. Mission of the Institute

The Institute of Radioelectronics perceives its long-term mission in bridging the gaps between academia, industry, and society. This mission is broken into three measurable objectives: to provide teaching of contemporary societal relevance; to seek excellence in scientific research; and to run projects meeting the international standards. Year 2000 has been successful in each regard: the number of M.Sc. (65) and B.Sc. (76) graduates has substantially increased; the contributions of several individuals and teams have been recognised with prestigious awards and nominations; and new challenging contracts for two foreign industries have been signed and fulfilled.

Considering the Institute of Radioelectronics as a unit of the Faculty, one should note and appreciate the extremely broad competence, which spans the whole field of radioelectronics. It comprises:

- electromagnetic and acoustic field theory as well as generation and propagation of electromagnetic and acoustic waves,
- signal theory, processing, coding, and transmission, with regard to electronic, electroacoustic and TV image signals,
- 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,
- measuring methods and systems,
- analysis, measurement and estimation of sound and image distortion.

A key asset of the Institute, which facilitates successful performance in such a variety of subjects, are the talents and the enthusiasm of its staff. Vigorous leadership is provided by 11 professors and 44 assistant professors, whose many accomplishments have gained world - wide recognition over the years. This year two of the Institute's professors, Prof. W.Gwarek and Prof. J.Modelski, have received Fellow IEEE Member nominations, which are highly prestigious as granted to no more than one out of thousand members of the Institute of Electrical and Electronics Engineers, the world's leading professional organisation in the field. Year 2000 has also brought an enhanced national recognition to the Institute's staff, as exemplified by two awards in the Master of Technology contest (including the main prize), and two awards of the Minister of Education. The team of scientist from Electroacoustics Division under the leadership of Prof. Z. Kulka was awarded to a silver medal during the 49-th World Exhibition of Innovation, Research and New Technology (Brussels, Belgium).

Besides people, another noteworthy asset of the Institute is its quite exceptional laboratory basis, a high profile expression of commitment to in-depth research, good engineering, and interactive teaching. In 2000 a new Laboratory for Computer Tomography has been created, thanks to the generous donation by Central Clinical Hospital for the Ministry of Internal Affairs and

Administration. The Electroacoustics Laboratory has been supplemented with the System Two Cascade (SYS-2522), a new generation of DSP power audio analyser - a Dual Domain System including the complete standard analog generator and analyser sections plus the cascaded digital signal processors. Since 1999, the Laboratory for Measurements in Radiocommunications exists and offers state-of-art instruments such as vector signal analyser, GSM and CDMA mobile station testers, network and spectrum analysers, and signal generators. The Institute has an anechoic chamber and a sound studio, an HP ImagePoint, and various professional software packages. On the whole, over 10 other laboratories are available to the students, as well as the computer network modernised with new equipment.

Within the Institute of Radioelectronics, dedication, open mindedness, creativity, and just plain verve are the qualities preserved and descended onto the students and Ph.D. students (now 47). The 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. Just like their success confirms the quality of teaching provided, so do the completed projects re-affirmate the quality of research. The Institute aims to cover the full process of technological development, from innovative ideas up to the construction of prototypes. The products are applicable in: radio communication systems, radiolocation antennas, television equipment, radiomonitoring 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, and medicine.

The Institute of Radioelectronics carries out many of those tasks under a contract signed by the University with ALCATEL. It also has many direct long-term contracts, both national (with National Radiocommunication Agency PAR, Central Institute for Labour Protection, POLIXEL S.A., military institutions, and other ones), and international (with CERN). Admittedly, in 2000 the international dimension of the Institute's research has been greatly enhanced through the performance of two demanding industrial projects for Arris (USA) and Personal Chemistry (Sweden). They are resonant for the afore-mentioned international recognition of the Institute's staff, and indeed for the well-established collaboration with foreign research institutions including Université du Quebec a Trois-Rivieres (Canada), Ohio University, University of Waterloo, ZIBJ Dubna (Russia), Lviv Technical University (Ukraine), CERN (Switzerland) and Chalmers University of Technology (Sweden). The Institute always encourages participation of its staff and students in international scientific events.

As a compliment to regular studies, the Institute is deeply engaged in continuing education. The offer of over 30 courses is being dynamically extended, and certainly helps to strengthen the links with industry and commerce, and to extend the education to broader public, in accordance with the Institute's mission.

1.2. Board of Directors

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Deputy Director for Research

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Deputy Director for Academic Affairs

Piotr Brzeski, Ph.D., Assistant Professor
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Deputy Director for Technical Affairs

Maciej Konwicki, M.Sc., Head R&D Engineer
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1.3. Organisation of the Institute

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

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

The structure of the Institute includes the Audio-Visual Equipment Testing Laboratory and also Head Office Library, Financial Section and Supply Section.

1.3.1. Radiocommunications Division

Head of Division

Jacek Wojciechowski, D.Sc., Professor
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Senior academic staff

Tomasz Buczkowski, Ph.D.	Assistant Professor
Henryk Chaciński, M.Sc.	Senior Lecturer
Jacek Cichoński, Ph.D.	Assistant Professor
Krzysztof Czerwiński, Ph.D.	Assistant Professor
Adam Fiok, D.Sc.	Professor (0.5) (to 3.09.2000)

Stefan Hahn, D.Sc.	Professor (emeritus)
Jacek Jarkowski, Ph.D.	Assistant Professor
Wojciech Kazubski, Ph.D.	Assistant Professor
Waldemar Kielek, D.Sc.	Associate Professor (emeritus)

Jerzy Kołakowski, Ph.D.	Assistant Professor (from 1.12.2000)
Tomasz Kosiło, Ph.D.	Assistant Professor
Karol Radecki, Ph.D.	Assistant Professor
Błażej Sawionek, Ph.D.	Assistant Professor (to 30.09.2000)

Junior academic staff

Fathi Ali Alwafie, M.Sc.	Ph.D. Student
Dariusz Grabowski, M.Sc.	Ph.D. Student
Stanisław Maszczyk, M.Sc.	Ph.D. Student
Grzegorz Radzikowski, M.Sc.	Ph.D. Student

Kajetana Snopek, M.Sc.	Ph.D. Student
Zbigniew Walczak, M.Sc.	Ph.D. Student

Technical staff

Marek Marcinkowski (from 28.09.2000)
Stanisław Żmudzin, M.Sc. (0.5)

The teaching activities of the Radiocommunications Division are related to radiocommunication systems, antennas, signal processing, measurement in radiocommunications, and networks. Research is focused on specific problems of radiocommunications, such as:

- digital modulations,
- optimization methods of antenna synthesis,
- multidimensional signals theory,
- mobile systems,
- measurement in radiocommunications,
- electromagnetic spectrum monitoring,
- networks (radio and telecommunications),
- high-frequency measuring systems intended for testing radiocommunication equipment,
- radiomonitoring methods and systems,
- cellular communication systems (GSM, UMTS, TETRA).

Current research topics include:

- theory and applications of multidimensional complex signals,
- application of Hilbert transform to antenna radiation pattern forming and optimization,
- application of wavelet transforms in radiocommunication measurements,
- digital modulations broadcasting in AM bands,
- application of GPS for selected geodetic measurements,
- health and environmental aspects of electronics,
- fault detection in electronic systems,
- simulation and design of networks,
- scheduling in radio networks,
- development of mobile radiomonitoring systems.

1.3.2. Television Division

Head of Division (from 1.10.2000)

Władysław Skarbek, D.Sc., Professor
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Senior academic staff

Józef Modelski, D.Sc.	Professor
Andrzej Buchowicz, Ph.D.	Assistant Professor
Krzysztof Derzakowski, Ph.D.	Assistant Professor
Krzystian Ignasiak, Ph.D.	Assistant Professor
Jerzy Kondarewicz, M.Sc.	Senior Lecturer (0.5)
Andrzej Krupiczka, Ph.D.	Assistant Professor
Tomasz Krzymień, M.Sc.	Senior Lecturer (from 1.10.2000)

Marek Rusin, Ph.D.	Assistant Professor (0.5)
Yevhen Yashchyshyn, Ph.D.	Assistant Professor

Junior academic staff

Grzegorz Galiński, M.Sc.	Ph.D. Student
Artur Gałat, M.Sc.	Ph.D. Student
Tomasz Keller, M.Sc.	Ph.D. Student

Krzysztof Kurek, M.Sc.	Ph.D. Student
Maciej Łempkowski, M.Sc.	Ph.D. Student
Jacek Marzyjanek, M.Sc.	Ph.D. Student
Andrzej Mędrzak, M.Sc.	Ph.D. Student
Nguyen Minh, M.Sc.	Ph.D. Student
Krzysztof Mroczek, M.Sc.	Ph.D. Student
Marcin Piasecki, M.Sc.	Ph.D. Student
Adam Pietrowcew, M.Sc.	Ph.D. Student
Andrzej Ritz, M.Sc.	Ph.D. Student
Wojciech Sadowski, M.Sc.	Ph.D. Student
Robert Seta, M.Sc.	Ph.D. Student
Ewa Snitkowska, M.Sc.	Ph.D. Student
Paweł Sokołowski, M.Sc.	Ph.D. Student
Mulugeta Tsegaye, M.Sc.	Ph.D. Student
Karol Wnukowicz, M.Sc.	Ph.D. Student

Technical staff

Tomasz Smakuszewski, M.Sc.

Television Division conducts scientific and applied research in the area of terrestrial, satellite and cable television systems, analogue and digital components of television systems, broadcasting equipment as well as digital image processing. Intensive activities in the multimedia area are continued. Specific research topics in 2000 included:

- image compression techniques - wavelet transform; vector quantisation, high compression ratio algorithms;
- intelligent multimedia systems - object tracking and recognition, compression controlled by segmentation, semantic preserving compression methods;
- multimedia converged (video, data and voice) and interactive services;
- algorithms of image motion detection and estimation;
- non-linear filters for colour image processing;
- selected topics in the design of cable television networks;
- computer graphics in TV postproduction;
- dielectric resonators - analysis, design techniques;
- visualisation of the electromagnetic field in a resonator;
- closed circuit TV;
- analysis and design of microwave antennae;
- applications of ferroelectric materials to microstrip patch antennae.

1.3.3. Electroacoustics Division

Head of Division

Zbigniew Kulka, D.Sc., Professor (from 1.05.2000)
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Senior academic staff

Ewa Kotarbińska, Ph.D.	Assistant Professor
Andrzej Leszczyński, Ph.D.	Assistant Professor
Jerzy Narkiewicz-Jodko, Ph.D.	Assistant Professor
Maria Tajchert, Ph.D.	Assistant Professor

Junior academic staff

Jan Paluchowski, M.Sc.	Assistant
Grzegorz Kustra, M.Sc.	Ph.D. Student
Piotr Kwiecień, M.Sc.	Ph.D. Student
Arkadiusz Nagórski, M.Sc.	Ph.D. Student
Piotr Nykiel, M.Sc.	Ph.D. Student
Mariusz Siek, M.Sc.	Ph.D. Student

Radosław Smoliński, M.Sc.	Ph.D. Student
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The activities of the Division concern audioacoustics and ultrasonic techniques including investigations, measurements, and applications. They are focused on:

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

Current research topics include:

- digital audio signal processing;
- active noise reduction systems applied to acoustic waveguides;
- high frequency piezoelectric sensors for automation applications;
- detection of auditory warning signals in the presence of industrial noise;
- elaboration of computation methods for radiated acoustic field by surface acoustic sources in free space and their implementation on a PC.

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

1.3.4. Radio-Engineering Division

Head of Division (from 1.10.2000)

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Senior academic staff

Jan Ebert, D.Sc.	Tenured Professor
Konrad Adamowicz, Ph.D.	Assistant Professor (0.5)
Andrzej Miękina, Ph.D.	Assistant Professor
Mirosław Mikołajewski, Ph.D.	Assistant Professor
Juliusz Modzelewski, Ph.D.	Assistant Professor
Andrzej Podgórski, Ph.D.	Assistant Professor
Krzysztof Puczek, Ph.D.	Senior Lecturer (0.5)
Wiesław Winięcki, Ph.D.	Assistant Professor

Junior academic staff

Robert Łukaszewski, M.Sc.	Assistant
Piotr Bobiński, M.Sc.	Ph.D. Student
Cezary Niedziński, M.Sc.	Ph.D. Student
Paweł Sprzęczak, M.Sc.	Ph.D. Student
Tomasz Szafrąński, M.Sc.	Ph.D. Student
Andrzej Wajs, M.Sc.	Ph.D. Student

Technical staff

Ryszard Leoniak, M.Sc.

The activities of the Division concern fundamental and applied research associated with high-frequency techniques, metrology, instrumentation and measuring systems. They are focused on:

- improving the efficiency of high-frequency power sources and other high-frequency devices;

- improving the quality of measurements using signal-processing techniques;
- designing automated computer-based measuring systems.

Current research topics include:

- computer-aided analysis and synthesis of class D/E resonant amplifiers, resonant rectifiers, resonant dc/dc converters, uninterruptible power suppliers;
- software environment for computer-aided design of algorithms for reconstruction of measurands and for calibration of measuring systems;
- software environment for computer-aided design of measuring systems, virtual instrumentation, plug-in boards for data acquisition, IEEE-488 equipment, measuring systems for the measurement of wide-range broadcasting signals;
- computer-aided spectrophotometry for applications in the monitoring of natural environment;
- portable signal analysers for technical diagnostics and the monitoring of natural environment.

1.3.5. Microwave and Radiolocation Engineering Division

Head of Division

Tadeusz Morawski, D.Sc., Tenured Professor
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Senior academic staff

Wojciech Gwarek, D.Sc.	Tenured Professor (from 20.01.2000)
Stanisław Rosłonec, D.Sc.	Tenured Professor (from 30.10.2000)
Małgorzata Celuch-Marcysiak, Ph.D.	Assistant Professor
Krzysztof Kowalski, Ph.D.	Assistant Professor (0,5)
Przemysław Miazga, Ph.D.	Assistant Professor
Krzysztof Robaczyński, M.Sc.	Senior Lecturer (0.5)
Maciej Sypniewski, Ph.D.	Assistant Professor
Andrzej Więckowski, Ph.D.	Assistant Professor
Wojciech Wojtasiak, Ph.D.	Assistant Professor
Jolanta Zborowska, Ph.D.	Assistant Professor

Junior academic staff

Mirosław Andrzejewski, M.Sc.	Ph.D. Student
Dariusz Bednarczyk, M.Sc.	Ph.D. Student
Tomasz Ciamulski, M.Sc.	Ph.D. Student
Daniel Gryglewski, M.Sc.	Ph.D. Student
Marek Kukier, M.Sc.	Ph.D. Student
Ryszard Michnowski, M.Sc.	Ph.D. Student
Michał Rosiński-Potocki, M.Sc.	Ph.D. Student
Janusz Rudnicki, M.Sc.	Ph.D. Student
Konrad Szustak, M.Sc.	Ph.D. Student
Zbigniew Żolnierowicz, M.Sc.	Ph.D. Student

Technical staff

Krzysztof Kowalski, Ph.D.	Assistant Professor (0,5)
Krzysztof Robaczyński, M.Sc.	(0.5)
Mirosław Lubiejewski	

The Microwave and Radiolocation Engineering Division conducts scientific and applied research in the area of electromagnetic field theory, microwave theory and techniques, measurement techniques for very high frequency range as well as computer-aided design, data acquisition and data processing. Specific research topics in 2000 included:

- design of high-frequency systems for radar techniques (oscillators, synthesisers, modulators, amplifiers, high-power noise sources, transmitter/receiver modules);
- methods of synthesis and computer-aided design of passive and active microwave circuits (couplers, summatoms and dividers, switches, transistor circuits);
- analysis and design of multielement planar in-phase radar antenna arrays intended to work at high power level;
- development of new structures of noncommonsurate nonsynchronous transmission line stop-band filters and application of them in various radar equipments;
- development of new optimization algorithms for computer-aided synthesis of antenna arrays with especially shaped radiation patterns;
- design of modern computer-aided measuring systems;
- development of numerical methods and implementation of computer programmes for full-wave analysis and design of two- and three-dimensional microwave circuits (filters, matching circuits, uniform and periodic guiding structures, polarisers, antennae);
- development of non-linear programming and artificial intelligence methods, and their application to the automated design of microwave circuits.

1.3.6. Nuclear and Medical Electronics Division

Head of Division

Zdzisław Pawłowski, D.Sc., Tenured Professor
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Senior academic staff

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Piotr Bogorodzki, Ph.D.	Assistant Professor
Piotr Brzeski, Ph.D.	Assistant Professor
Tomasz Jamrógiewicz, M.Sc.	Senior Lecturer
Marek Karolczak, Ph.D.	Assistant Professor (on the leave)
Marian Kazubek, Ph.D.	Assistant Professor
Bogumił Konarzewski, Ph.D.	Assistant Professor
Janusz Marzec, Ph.D.	Assistant Professor
Jacek Mirkowski, Ph.D.	Assistant Professor
Lechisław Padee, Ph.D.	Senior Lecturer (0.33)
Artur Przelaskowski, Ph.D.	Assistant Professor
Waldemar Scharf, Ph.D.	Assistant Professor (emeritus)
Waldemar Smolik, Ph.D.	Assistant Professor
Roman Szabatin, Ph.D.	Assistant Professor
Krzysztof Zaremba, Ph.D.	Assistant Professor

Junior academic staff

Paweł Błociszewski, M.Sc.	Senior Lecturer (on the leave)
Tomasz Olszewski, M.Sc.	Lecturer
Ewa Piątkowska-Janko, M.Sc.	Lecturer
Walid Al-Him, M.Sc.	Ph.D. Student
Dariusz Janusek, M.Sc.	Ph.D. Student
Robert Kurjata, M.Sc.	Ph.D. Student
Mateusz Orzechowski, M.Sc.	Ph.D. Student
Tomasz Wolak, M.Sc.	Ph.D. Student

Technical and administrative staff

Dariusz Ćwiek, M.Sc.	(on the leave)
Andrzej Wasilewski	
Joanna Witkowska	

The research and teaching activities carried out in the Nuclear and Medical Electronics Division are concentrated on Biomedical Engineering. Research in this inter-disciplinary area covers a broad range of topics and integrates sophisticated electronics and information technology with elements of medical knowledge. The Division's research is focused on following topics:

- nuclear medicine (emission tomography: SPECT, PET);
- quantitative computer-aided tomography;
- tomographic dynamic studies;
- process tomography;
- magnetic resonance imaging;
- analogue and digital radiography;
- medical image processing and recognition;
- methods and instrumentation for electrocardiography, high resolution electrocardiography and electro-encephalography;
- medical applications of isotope techniques;
- biomedical accelerators.

Areas of recent studies include:

- methodology and apparatus for non-invasive determination of bone density and concentration of heavy metals in bone;
- electrical instability of heart study;
- multimodal imaging of topographic, tomographic and functional studies in medicine;
- correlated methods for the investigation of neurosystems by NMR and SPECT tomography;
- MR imaging sequence optimisation for better contrast resolution in heart and large vessels examination;
- telecardiology;
- field homogeneity in MRI tomography improvement with combined "passive" and "active" approach;
- expert systems for high resolution ECG with P-wave averaging technique;
- application of wavelet transform for echocardiographic images' quality improvement and for image data compression;
- algorithms for 3D brain imaging;
- dynamic tomographic studies (aided method of early diagnosis of brain strokes);
- digital structural radiography;
- X-ray stereoscopy.

2. STAFF

2.1. Senior academic staff

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Academic Staff Development ('99-); Member of the Conference Programme Committees of: the National Conference on Computer Graphics and Image Processing GKPO'90 and GKPO'92; the International Conference on Computer Graphics and Image Processing GKPO'94, 5th, 6th, and 7th International Conferences CAIP'93, CAIP'95, and CAIP'97, CAIP'99 and Chairman of CAIP'2001 on Computer Analysis of Images and Patterns; Head of Polish National Committee for Standardization in Multimedia ('99-); Member of Advisory Board of International Journal "Machine Graphics & Vision" ('92-'95) and "Image Processing and Communications" ('95-); team award of the Minister of National Education (2000); [Edu32], [Edu65], [Edu71], [Edu121]; [Pro12], [Pro25], [Pro51], [Pro56]; [MSc16], [MSc50]; [BSc8], [BSc9], [BSc39], [BSc41], [BSc47]; [Pub3], [Pub50], [Pub51], [Pub62], [Pub64], [Pub118], [Pub128], [Pub131], [Pub135]; [Rep33], [Rep34], [Rep35]; [Con24], [Con31]

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[Pub122], [Pub145], [Pub146], [Pub147], [Pub148], [Pub154], [Pub155], [Pub164]; [Rep41], [Rep42]; [Con12], [Con23]

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Mirosław Andrzejewski, M.Sc. Ph.D. Student

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Piotr Bobiński, M.Sc. Ph.D. Student

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Grzegorz Domański, M.Sc. Ph.D. Student

Grzegorz Galiński, M.Sc. Ph.D. Student

Artur Gałat, M.Sc. Ph.D. Student

Dariusz Grabowski, M.Sc. Ph.D. Student

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3. TEACHING ACTIVITIES (academic year 1999/2000)

3.1. Basic courses

- [Edu1] *Basics of Computer Technique* (Podstawy techniki komputerowej - PTKO); 4h/week; semester 1; A. Więckowski.
- [Edu2] *Basics of High-Frequency Technique - Lab.* (Podstawy techniki w.cz. - TWCZ); 2h/week; semester 4; W. Wojtasiak.
- [Edu3] *Basics of Television* (Podstawy telewizji - POTE); 3h/week; semester 6; A. Buchowicz.
- [Edu4] *Basics of Electroacoustics* (Podstawy elektroakustyki - PEA); 3h/week; semester 6; A. Leszczyński, J. Narkiewicz-Jodko.
- [Edu5] *Computer Networks* (Sieci komputerowe - SKP1); 1h/week; semester 5; J. Marzec.
- [Edu6] *Detection of Nuclear and Medical Signals* (Detekcja sygnałów biomedycznych i jądrowych - DSBJ); 4h/week; semester 6; Z. Pawłowski.
- [Edu7] *Electronics III* (Elektronika III - ELKA III); 2h/week; semester 4; T. Olszewski.
- [Edu8] *Fields and Waves* (Pola i fale - POFA); 3h/week; semester 3; T. Morawski, W. Gwarek.
- [Edu9] *Materials, Components, and Designs* (Materiały, elementy i konstrukcje - MEIK); 1h/week; laboratory; semester 6; J. Cichocki.
- [Edu10] *Measuring Systems* (Systemy pomiarowe - SPOM); 6h/week; semester 5; W. Winiecki.
- [Edu11] *Measuring Systems I* (Systemy pomiarowe I - SPOM I); 4h/week; semester 5; W. Winiecki.
- [Edu12] *Measuring Systems II* (Systemy pomiarowe II - SPOM II); 4h/week; semester 6; W. Winiecki.
- [Edu13] *Medical Electronic Instrumentation* (Elektroniczna aparatura medyczna - EAME); 4h/week; semester 5 - 6; L. Padée.
- [Edu14] *Microprocessor Techniques* (Podstawy techniki mikroprocesorowej - TMIK); 4h/week; semester 5; K. Czerwiński.
- [Edu15] *Numerical Methods* (Metody numeryczne - MNM); 3h/week; semester 3; R. Z. Morawski.
- [Edu16] *Operating Systems* (Systemy operacyjne - SOP); 3h/week; semester 5; M. Sypniewski.
- [Edu17] *Orientation 1* (Orientacja 1 - OR1); 1h/week; semester 1; W. Gwarek.
- [Edu18] *Orientation 2* (Orientacja 2 - OR2); 1h/week; semester 2; P. Bogorodzki, M. Mikołajewski.
- [Edu19] *Orientation 3* (Orientacja 3 - OR3); 1h/week; semester 3; P. Bogorodzki, M. Mikołajewski, A. Buchowicz, J. Modzelewski.
- [Edu20] *Orientation 4* (Orientacja 4 - OR4); 1h/week; semester 4; E. Piątkowska-Janko, M. Tajchert, A. Buchowicz, J. Modzelewski.
- [Edu21] *Orientation 5* (Orientacja 5 - OR5); 1h/week; semester 5; E. Piątkowska-Janko, R. Szabatin.
- [Edu22] *Orientation 6* (Orientacja 6 - OR6); 1h/week; semester 6; P. Brzeski.
- [Edu23] *Programming* (Programowanie - PROG); 5h/week; semester 2; A. Podgórski.
- [Edu24] *Programming 2* (Programowanie 2 - PROG2); 3h/week; semester 5; W. Smolik.
- [Edu25] *Radiology and Nucleonics* (Radiologia z Nukleoniką - NK); 3h/week; semester 5; W. Scharf.
- [Edu26] *Signals and Systems* (Sygnały i Systemy - SYS); 4h/week + laboratory; semester 3; J. Wojciechowski.
- [Edu27] *Theory of Signals and Modulations* (Teoria sygnałów i modulacji - TSIM); 3h/week + laboratory; semester 4; K. Radecki, J. Wojciechowski.

3.2. Advanced courses

- [Edu28] *Analysis and Synthesis of Microwave Circuits* (Analiza i synteza układów mikrofalowych - ASUM); 3h/week; elective; S. Rostłonec.
- [Edu29] *Antennae and Radiowave Propagation* (Anteny i propagacja fal - AIPF); 3h/week; elective; J. Jarkowski.
- [Edu30] *Artificial Neural Networks in Medicine* (Sztuczne sieci neuronowe w medycynie - SESN); 3h/week; elective; K. Zaremba.
- [Edu31] *Basics of Medical Imaging Techniques* (Podstawy technik obrazowania w medycynie - PRIR); 4h/week; elective; P. Brzeski.
- [Edu32] *Basics of Multimedia Techniques* (Podstawy technik multimedialnych - PTMU); 3h/week; elective; W. Skarbek, K. Ignasiak, A. Krupiczka.
- [Edu33] *Basics of Radiocommunications* (Podstawy radiokomunikacji - PR); 3h/week; elective; T. Kosiło.

- [Edu34] *Basics of Radiolocation and Navigation* (Podstawy radiolokacji i nawigacji - PRIR); 3h/week; elective; S. Rosloniec.
- [Edu35] *Biomedical Accelerators* (Akceleratory biomedyczne - ABM); 2h/week; elective; W. Scharf.
- [Edu36] *Biomedical Signals Processing* (Cyfrowe przetwarzanie sygnałów biologicznych - CPSB); 4h/week; elective; W. Wierzejski.
- [Edu37] *Cable Television* (Telewizja przewodowa - TVP); 3h/week; elective; J. Modelski.
- [Edu38] *Computed Tomography* (Tomografia komputerowa - TOM); 4h/week; elective; J. Mirkowski.
- [Edu39] *Computer Systems* (Systemy komputerowe - SYKO); 3h/week; elective; T. Jamrógiewicz.
- [Edu40] *Contemporary Applications of Microwaves* (Współczesne zastosowania mikrofal - WZN); 3h/week; elective; J. Modelski.
- [Edu41] *Data Compression 2* (Kompresja danych 2 - KODA2); 3h/week; elective; A. Przelaskowski.
- [Edu42] *Digital Audio Signal Processing* (Cyfrowe przetwarzanie sygnałów fonicznych - CPSF); 3h/week; elective; Z. Kulka.
- [Edu43] *Digital Circuits - Laboratory* (Układy logiczne; laboratorium - UKLO); 2h/week; semester 4; K. Zaremba.
- [Edu44] *Digital Circuits* (Układy logiczne - UKLO; A13); 2h/week elective; P. Miazga.
- [Edu45] *Digital Image Processing* (Cyfrowe przetwarzanie obrazów - CPOO); 4h/week; elective; M. Kazubek.
- [Edu46] *Digital Information Transmission* (Cyfrowa transmisja informacji - CTIN); 2h/week, project: 1h/week; elective; T. Buczkowski, T. Kosiło, J. Wojciechowski.
- [Edu47] *Digital and Interactive Television Systems* (Telewizja cyfrowa i interaktywna - TCI); 4h/week; elective; A. Krupiczka.
- [Edu48] *Digital Processing of Measurement Signals* (Cyfrowe przetwarzanie sygnałów pomiarowych - CPSP); 3h/week; elective; R. Z. Morawski.
- [Edu49] *Electromagnetic Compatibility* (Kompatybilność elektromagnetyczna - KE); 2h/week; elective; W. Gwarek.
- [Edu50] *Electromagnetic Field Theory* (Teoria pola elektromagnetycznego - TPE); 4h/week; elective; T. Morawski.
- [Edu51] *Environmental Acoustics* (Akustyczna ochrona środowiska - AOS); 3h/week; elective; E. Kotarbińska.
- [Edu52] *Graphs and Networks* (Grafy i Sieci - GIS); 4h/week, project; elective; M. Pióro, J. Wojciechowski.
- [Edu53] *GSM and Third Generation Cellular Systems* (GSM i systemy komórkowe trzeciej generacji - GSMS); 4h/week; elective; J. Cichocki, J. Kołakowski.
- [Edu54] *Information Technology in Medical Diagnostics* (Techniki informacyjne w diagnostyce medycznej - TIM); 4h/week; elective; P. Bogorodzki.
- [Edu55] *Magnetic Resonance Imaging* (Tomografia rezonansu magnetycznego - TRM); 4h/week; elective; P. Bogorodzki.
- [Edu56] *Measured Data Analysis in Medicine* (Analiza danych pomiarowych w medycynie - ADP); 3h/week; elective; Z. Pawłowski.
- [Edu57] *Measuring Systems Software* (Oprogramowanie systemów pomiarowych - OSP); 4h/week; elective; W. Winiecki.
- [Edu58] *Methods and Algorithms for Processing of Measurement Signals* (Metody i algorytmy przetwarzania sygnałów pomiarowych - MAP); 3h/week; elective; A. Miękina, A. Podgórski.
- [Edu59] *Methods and Equipment for Organ Structure Visualisation* (Metody i urządzenia do wizualizacji struktur narządowych - MWSN); 3h/week; elective; R. Szabatin.
- [Edu60] *Microstrip and Adaptive Antennae* (Anteny paskowe i adaptacyjne - APA); 4h/week; elective; Y. Yashchysyn.
- [Edu61] *Microwave Technique* (Technika mikrofalowa - TMO); 3h/week; elective; J. Zborowska.
- [Edu62] *Mobile Radio Communications* (Radiokomunikacja ruchoma lądowa - RRL); 3h/week; elective; T. Kosiło.
- [Edu63] *Noise Control* (Ochrona przed hałasem); 2h/week; elective; E. Kotarbińska.
- [Edu64] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej - TMN); 4h/week; elective; R. Szabatin.
- [Edu65] *Object Oriented Programming of Distributed and Multimedia Applications in Java* (Java - obiektowe programowanie aplikacji rozproszonych i multimedialnych - OPA); 3h/week; elective; W. Skarbek.
- [Edu66] *Power Supply of Electronic Instruments* (Zasilanie urządzeń elektronicznych - ZUE); 3h/week; elective; M. Mikołajewski.
- [Edu67] *Radioelectronics Measurements* (Miernictwo radioelektroniczne - MR); 3h/week; elective; J. Cichocki.
- [Edu68] *Radiological Apparatus in Medical Diagnosis* (Aparatura radiologiczna w diagnostyce medycznej - ARDM); 2h/week; elective; A. Piątkowski.

- [Edu69] *Radio Transmitting Technique and its Applications* (Technika nadawania radiowego i jej aplikacje - TNR); 4h/week; elective; J. Modzelewski, M. Mikołajewski.
- [Edu70] *Satellite Communications* (Łączność satelitarna - ŁS); 3h/week; elective; J. Modelski.
- [Edu71] *Semantic Analysis of Images and Sounds* (Analiza semantyczna obrazu i dźwięku - ASOD); 3h/week; elective; W. Skarbek.
- [Edu72] *Software for Medical Systems* (Oprogramowanie systemów medycznych - OSM); 3h/week; elective; W. Smolik.
- [Edu73] *Sound Recording and Forming* (Odbiór i kształtowanie dźwięku - OKD); 3h/week; elective; M. Tajchert.
- [Edu74] *System Measuring and Controlling Devices* (Systemowe urządzenia pomiarowe i sterujące - SUPS); 4h/week; elective; K. Adamowicz.
- [Edu75] *Technique of a Radio Receiving* (Technika odbioru radiowego - TOR); 2h/week; elective; W. Kazubski.
- [Edu76] *Technique of a Television Receiving* (Technika odbioru telewizyjnego - TOT); elective; 3h/week; M. Rusin.
- [Edu77] *Theory and Designing of Antennae* (Teoria i projektowanie anten - TPA); 4h/week; elective; Y. Yashchyshyn.
- [Edu78] *Ultrasonography Instrumentation* (Aparatura ultrasonograficzna - AUS); 3h/week; elective; L. Padee.
- [Edu86] *Digital Data Transmission* (Cyfrowa transmisja danych - CTSR); 43h/sem.; semester 5; T. Kosiło.
- [Edu87] *Fields and Waves* (Pola i fale - PFR); 72h/sem.; semester 2; T. Morawski.
- [Edu88] *Frequency Standards* (Wzorce częstotliwości - WCR); 32h/sem.; semester 7; K. Radecki, T. Buczkowski.
- [Edu89] *Materials and Elements* (Materiały i elementy - MER); 16h/sem.; semester 4; K. Radecki.
- [Edu90] *Multimedia Techniques* (Techniki multimedialne - TMR); 20h/sem; semester 6; A. Krupiczka.
- [Edu91] *Numerical Methods* (Metody numeryczne - MNR); 35h/sem.; semester 3; A. Miękina.
- [Edu92] *Programmable Digital Systems* (Programowalne układy cyfrowe - PUCR); 32h/sem.; semester 5; T. Buczkowski, T. Olszewski.
- [Edu93] *Programming* (Programowanie - PMR); 32h/sem.; semester 3; W. Smolik.
- [Edu94] *Project 1 (systematic)* (Projekt 1-układowy - PUR); 30h/sem.; semester 5; K. Kowalski.
- [Edu95] *Propagation of Waves* (Propagacja fal - PFR); 16h/sem.; semester 4; J. Jarkowski.
- [Edu96] *Radioelectronics Measurements* (Miernictwo radioelektroniczne - MRR); 42h/sem.; semester 5; J. Cichocki.
- [Edu97] *Radiocommunication Systems I* (Systemy radiokomunikacyjne I - SRK); 36h/sem. + lab. 3h +proj. 15h, semester 6; T. Kosiło.
- [Edu98] *Radiocommunication Systems II* (Systemy radiokomunikacyjne II - SRK); 36h/sem. + lab. 3h +proj 15h; semester 7; T. Kosiło.
- [Edu99] *Technique of Emission and Receiving* (Technika emisji i odbioru - TER); 40h/sem.; semester 4; J. Modzelewski, W. Kazubski.
- [Edu100] *Transmitters and Receivers Measurements* (Pomiary nadajników i odbiorników - PNOR); 32h/sem.; semester 7; J. Cichocki.

3.3. Courses for part-time studies on Radiocommunications

- [Edu79] *Antennae* (Anteny - ANR); 34h/sem.; semester 4; S. Rosłonec.
- [Edu80] *Basics of Computer Techniques* (Podstawy techniki komputerowej - PTKR); 70h/sem.; semester 1; J. Marzec.
- [Edu81] *Basics of Digital Circuits and Microprocessing Technique* (Podstawy układów logicznych i techniki mikroprocesorowej - PULR); 55h/sem.; semester 4; K. Czerwiński.
- [Edu82] *Basics of High-Frequency Techniques* (Podstawy techniki w.cz. - PTWR); 65h/sem.; semester 3; K. Kowalski.
- [Edu83] *Basics of Metrology* (Podstawy metrologii - PMER); 40h/sem.; semester 1; J. Ołędzki.
- [Edu84] *Basics of Satellite Communications* (Podstawy łączności satelitarnej - SATR); 20h/sem.; semester 4; J. Modelski.
- [Edu85] *Computed Controlling and Data Processing* (Komputerowe sterowanie i przetwarzanie

3.4. Special courses

Abbreviations used in the description of the courses:
SPR - Postgraduate Course on Radiocommunications
RAD - Courses on Radiocommunications, Electroacoustics and Medical Engineering (RADEM)
SAT - Studies on Audiological Techniques, series of courses; 180h; twice a year.

- [Edu101] *Access Network Systems* (Systemy i sieci dostępu - SSD); 3x13h; three times a year; **RAD**; A. Kalinowski, T. Kosiło.
- [Edu102] *Antennae and Radiowave Propagation* (Anteny i propagacja fal - PF); 16h; **SPR**; J. Jarkowski.
- [Edu103] *Basics of Digital GSM System* (Podstawy cyfrowego systemu telefonii komórkowej GSM - SGSM); 24h; once a year; **RAD**; J. Cichocki, J. Kołakowski.
- [Edu104] *Basics of Fiber Optics Telecommunications* (Podstawy telekomunikacji światłowodowej - PTS); 20h; **SPR**; J. Siuzak.
- [Edu105] *Cable Television* (Telewizja kablowa - TP); 38h; once a year; **RAD**; T. Krzymień.
- [Edu106] *Computer Controlled Measurement and Data Processing* (Komputerowe sterowanie i przetwarzanie danych - KSP); 28h + 9 lab.; **SPR**; A. Więckowski, W. Winiecki.
- [Edu107] *Contemporary Telecommunication Networks* (Współczesne sieci telekomunikacyjne - WST); 20h; **SPR**; M. Dąbrowski.
- [Edu108] *Digital and Interactive Television Systems* (Telewizja cyfrowa i interaktywna - TCI); 6h; once a year; **RAD**; A. Krupiczka, T. Krzymień.
- [Edu109] *Digital Signal Transmission* (Cyfrowa transmisja sygnałów - CTS); 28h; **SPR**; T. Kosiło.
- [Edu110] *Modern Telecommunication Networks* (Współczesne sieci telekomunikacyjne - WST); 20h; **SPR**; M. Dąbrowski.
- [Edu111] *Digital Cellular Systems* (Cyfrowe systemy komórkowe - CSK); 16h; **SPR**; J. Cichocki, J. Kołakowski.
- [Edu112] *Digital Signal Processing* (Cyfrowe przetwarzanie sygnałów - CPS); 16h; **SPR**; A. Jakubiak.
- [Edu113] *Introduction to UMTS* (Wprowadzenie do systemu UMTS - UMTS); 22h; once a year; **RAD**; J. Cichocki, J. Kołakowski.
- [Edu114] *Law in Telecommunications* (Prawo w telekomunikacji - PT); 4x15h; **RAD**; four times a year; C. Woźniak.
- [Edu115] *Law in Telecommunications* (Prawo w telekomunikacji - PT); 20h; **SPR**; C. Woźniak.
- [Edu116] *Management and Marketing* (Zarządzanie i marketing - ZM); 20h; **SPR**; L. Białoń.
- [Edu117] *Management in Telecommunication Networks* (Zarządzanie sieciami telekomunikacyjnymi - ZST); 30h; once a year; **RAD**; M. Bromirski.
- [Edu118] *Microprocessor Engineering* (Technika mikroprocesorowa - TMP); 20h; **SPR**; K. Czerwiński.
- [Edu119] *Modern Measuring and Control Systems* (Współczesne systemy pomiarowo-kontrolne -WSPK); 31h; once a year; **RAD**; W. Winiecki.
- [Edu120] *Modern Radiocommunication and Broadcasting Systems* (Współczesne systemy radiokomunikacyjne i radiofoniczne - WRR); 32h; **SPR**; T. Kosiło.
- [Edu121] *Multimedia in Telecommunications* (Multimedia w telekomunikacji - MMT); 2x16h; **RAD**; twice a year; W. Skarbek.
- [Edu122] *Planning and Designing of Telecommunication Networks* (Planowanie i projektowanie sieci telekomunikacyjnych - PPST); 5x13h; **RAD**; five times a year; A. Drobnik.
- [Edu123] *Radio - Access Systems* (Systemy radio-dostępu abonenckiego - SDA); 21h; **SPR**; A. Kalinowski.
- [Edu124] *Radio Links and Satellite Communications* (Linie radiowe i łączność satelitarna - LR); 20h; **SPR**; J. Zygierewicz.
- [Edu125] *Systems and SDH Networks* (Systemy i sieci SDH - SSDH); 3x24h; three times a year; **RAD**; S. Kula.
- [Edu126] *Synchronization of Telecommunication Networks* (Synchronizacja sieci telekomunikacyjnych - SST); 2x13h; twice a year; **RAD**; S. Kula, C. Dreger, K. Radecki.
- [Edu127] *Surface Assembly - Designing and Technology* (Montaż powierzchniowy - projektowanie i technologia - MPPT); 20h; once a year; **RAD**; R. Kisiel, A. Miękina.
- [Edu128] *System of Signalling No.7* (System sygnalizacji nr 7 - SS7); 21h; once a year; **RAD**; M. Bromirski.
- [Edu129] *Theory of E-M Fields and Microwaves* (Problemy teorii pola i techniki mikrofalowej - PTM); 20h; **SPR**; K. Kowalski.
- [Edu130] *Wide - band Systems in Telecommunications* (Systemy szerokopasmowe w telekomunikacji - SST); 16h; **SPR**; A. Dąbrowski.

3.5. International co-operation

- [Edu131] SOCRATES Programme: **Higher Education.**
T. Kosiło, Ph.D., T. Buczkowski, Ph.D.
1999-2001

In the frame of SOCRATES Institutional Contract two bilateral programmes were realised: between Institute

of Radioelectronics of Warsaw University of Technology and:

- Katholieke Hogeschool Sint – Lieven, Gent, Belgium
- Instituto Superior Tecnico, Universidade Tecnica de Lisboa, Lisboa, Portugal

In both cases the Student Mobility actions were realised in the frame of Electronics and Telecommunication Engineering (Socrates code 06.05). The objective of the programme is to realize

a student project at the partner University. The Student Mobility programme was as follows:

- Poland-Portugal; one student for 6 months
 - Poland-Belgium, two students for 4 months
- In the frame of cooperation with Belgium there was also realised a "teaching staff mobility of short duration action" (Socrates code 06.05).
- Belgium-Poland; one lecturer for one week
 - Poland-Belgium; one lecturer for one week

4. RESEARCH PROJECTS

4.1. Projects granted by the University

Statutory projects

[Pro1] **Implementation and Investigation of the Selected Algorithms for Interpretation of Measurement Data** (Realizacja i badanie wybranych algorytmów interpretacji danych pomiarowych).

Roman Z. Morawski, Prof., D.Sc.,

A. Miękina, A. Podgórski

27.07.99 - 30.04.2000

The main objectives of the project are related to the design and implementation of new algorithms for calibration of measurement channels and reconstruction of measurands, as well as to the design of the procedures for uncertainty analysis of those algorithms, and to the upgrading of the corresponding research infrastructure. A new systematic approach to the classification and analysis of the algorithms for quasi-dynamic calibration of measurement channels and measurand reconstruction have been developed. Several new interval-algebra-based procedures for the accuracy analysis of weakly nonlinear algorithms have been designed, implemented and verified. The algorithms and instrumentation for frequency-domain analysis of acoustic-range signals have been studied as well. The results of the research accomplished have been published in [Pub 30].

[Pro2] **Modification of Video Preprocessing System for Real Time Applications** (Modyfikacja systemu do wstępnego przetwarzania obrazów w systemach wizyjnych czasu rzeczywistego).

Józef Modelski, Prof., D.Sc.,

K. Mroczek

27.07.99 - 30.04.2000

This work deals with problem of implementation video preprocessing algorithms in reconfigurable PLD processors for real time applications. Many dedicated pipelined hardware processors architectures have been analysed, especially for implementation in the new high density CPLD/FPGA devices. Modification of standard version a pipeline MISD architecture has been proposed. This modification allowed to integrate several hardware processors in one high density PLD chip with the computational possibilities better than the standard version. Next, an adaptive size local memory buffer has been added for this new MISD multiprocessor to extend application range for more complex preprocessing algorithms.

[Pro3] **Research and Development of Electro-acoustic Systems for Studio and Measurement Applications** (Badania i rozwój elektroakustycznych systemów studyjnych i pomiarowych).

Zbigniew Kulka, Prof., D. Sc.,

A. Leszczyński, M. Tajchert, J. Narkiewicz-Jodko, P. Kwiecień, P. Nykiel, R. Smo-liński, A. Aronowski.

27.07.99 - 30.04.2000

The works related to sound studio development were continued, including the investigation and analysis of the acoustic properties of two control rooms: student's and commercial. On this basis, the proposal of the control room adaptation, as well as the hardware project for student's one, were accomplished. Simultaneously, the sound reproduction system was designed and checked. The results of the two recordings (piano soloist music and postproduction sound recording) by means of two condenser microphones, have been presented on the CD-R compact disk as follows above:

- Elaboration of configuration and regulation method of the multichannel sound reproduction system for home theatre.
- Elaboration of two new measuring stations based on Audio Precision System One and PC computer for audio amplifiers and CD/DVD players according to prepared procedures.
- Development of filtering algorithm of two-way digital loudspeaker crossover and their implementation on Motorola's DSP 56002.

[Pro4] **Development of Network Video Streams Communication System for the Interactive Television by the Usage of Available Technologies** (Opracowanie i implementacja systemu sieciowej transmisji strumieni wideo na potrzeby telewizji interaktywnej z wykorzystaniem dostępnych technologii).

Andrzej Krupiczka, Ph.D.,

A. Buchowicz, T. Smakuszewski,

J. Kondarewicz

27.07.99 - 30.04.2000

The goal of this reaserach is the development of network video streams communication system for the interactive television based on the Java Media Framework multimedia architecture. In this project the application software for JMF-based VideoServer has been developed, which by the usage of the RTP transmission protocol enables its resources in the form of the compressed video files for clients modules (JMF-Players) in this system. The major difficulty of this RTP-based communication system is to achieve good quality of multimedia data on the receiver side. One can quite easy design and develop software based on JMF API interface for the typical application as well as advanced multimedia services system. The main drawback of this approach is relatively low computational performance and a lack of system stability from time to time.

[Pro5] **Design, Modelling and Measurements of Selected Microwave Circuits** (Projektowanie, modelowanie i pomiary wybranych układów mikrofalowych).

Tadeusz Morawski, Prof., D. Sc.,

W. Gwarek, K. Kowalski

27.07.99 - 30.04.2000

- *Design and measurements of selected active and passive microwave circuits*

Method for the designing of wideband stop filters was elaborated. These filters have a high electrical

strength and mechanical resistance.

Multipoint measurement system for determining the reflectance and transmittance of two-port with active pulsed transistor have been also designed and constructed.

- *Electromagnetic modelling of selected microwave radiating structures*

A system of methods for the analysis and design of microwave antennae and antenna matching circuits has been developed. To adapt the previous implementations of FDTD and optimisation methods to this purpose, several specific problems have been solved: considerations of various structure symmetries in FDTD and in the near-to-far field transform algorithm, approximations of field singularities on the FDTD mesh, considerations of geometrical dimensions as variables in the optimisation process, setting up the interface between the initial circuit-based optimisation output, and the electromagnetic solver input.

- *Control systems with accelerate sensors for flying objects*

Laboratory model of control system for automatic driving of flying objects was elaborated. This system employs modern integrated accelerate sensor.

[Pro6] **Radiation Methods in Medical Techniques** (Metody radiacyjne w technikach medycznych).

Zdzisław Pawłowski, Prof., D.Sc.,

A. Piątkowski, M. Kazubek, R. Szabatin
27.07.99 - 30.04.2000

- *Models of light propagation in luminescent sensors for radiographic imaging*

The relation between light transport and parameters of luminescent sensors for radiographic imaging was investigated. Using Monte Carlo simulation method specialized programmes were developed for modeling light absorption, scattering (isotropic and anisotropic) and reflection (isotropic, anisotropic and mirroring). The light emission efficiency and modulation transfer function (MTF) were determined for luminescent sensors used in digital radiography.

- *Optimisation of MR techniques for best contrast resolution in heart and large vessels examinations*

The purpose of the project was to create and test procedures for imaging of blood flow in large vessels. The phantom of left ventricle of heart was created in order to verify mentioned procedures. This equipment provides pulsating blood flow phantom. The great advantage of this phantom is that it is possible to have the same parameters of the flow every time and it is also possible to control them. Based on the theoretical analysis of the MR sequences an application called „Exposition simulator” was created. It can visualize the contrast of the image depending on the parameters of the sequence. Equations for gradient echo sequences are more complicated than for spin echo. Using only PC computer the time of reaction for exposition simulator was too long. The problem was solved by implementation of most time critical procedures on the digital signal processor. Looking further ahead, the phantom can be used to calibrate MR quantitative examination of flow in heart and large vessels.

- *The free-hand three-dimensional ultrasound system*

Using a technique called 3D ultrasound imaging it is possible to reconstruct 3D object from a series of 2D images (B-scan). The key requirement of all free hand imaging system is calibration. This involves determining the position and orientation of the B-scan plane to the sensor mounted on the probe. We use a 3-D magnetic tracker pcBIRD (Ascension Technology). Calibration is performed by imaging a single cross-wire phantom. Our method is based on acquiring multiple images of the intersection of two nylon wires in a water tank. We use the stylus (in transmitter space) for recording the intersection point. We elaborated the robust algorithm for stylus calibration.

- *Research station for image analysis from Siemens DR tomograph*

The conception of a CT Laboratory (X-ray Computerized Tomography Laboratory) was created for obtaining a Siemens DR tomograph in Nuclear and Medical Division at the Institute of Radioelectronics. It was followed by a result of many intensive and time-consuming works. The tomograph has been tested by a special Commission. Additionally, a PC computer was connected to the central unit of the tomograph minicomputer (PDP11/44), emulating a VT 100 terminal. Special software was installed for acquisition and data transmission between PDP and PC computers. New screen monitors, after adaptation, have been connected to the system to enable tomographic images presentation. Modifications in software system PCTOMO (elaborated in N&M Division) have been made to make possible collaboration with CAD systems for endoprosthesis design and manufacturing. Communication procedures have been elaborated for medical images transmission according to the DICOM and ACR-NEMA standards. Appropriate library procedures have been created and tested. Additionally, a special DICOM viewer has been elaborated for medical image presentation.

- [Pro7] **Digital Transmission in Radio Links** (Transmisja cyfrowa w łączach radiowych)

Jacek Wojciechowski, Prof., D. Sc.,

T. Buczkowski, J. Cichocki, K. Czerwiński,
A. Fiok, J. Jarkowski, W. Kazubski,
T. Kosiło, K. Radecki, B. Sawionek,
H. Chaciński, D. Grabowski, J. Kołakowski,
S. Maszczyk, S. Żmudzin.
27.07.99-30.04.2000

- *Problems and methods of radio parameters measurement in IS-95 mobile stations system*

The project dealt with measurement methods for mobile stations operating in the IS-95 (Code Division Multiple Access) cellular system. It covered the following topics:

- analysis of problems and requirements concerning CDMA test arrangements,
- evaluation of feasibility for performance of such measurements in the Institute,
- completion of test arrangement and driving it into operation,
- elaboration of a concept of the software supporting measurements of chosen parameters.

The project resulted in the test arrangement for advanced investigation of CDMA signals and IS-95 mobile equipment. Acquired know-how allows for further development of investigations and teaching activity in the area of CDMA systems as well as performance of type-approval measurements (Institute has obtained an official competence certificate for carrying such measurements).

- *Designing of short radio - links in DICOM standard*

The idea of the project was to study ISM systems e.g., systems used for short distance indoor radio data transmission. The project concentrated on two types of such applications: radio links for data transmission between computers and RFID systems. The results of this work are : three students diploma works are in progress, one application for an university grant in the field of RFID systems was prepared. Propagation and indoor network performance was also studied within the grant. A paper was prepared as a result of this study.

- *Analysis of selected problems on modulation in DAB system*

A computer program for generation and spectral analysis of 36-ary and 64-ary QAM signals was prepared. Results of the research were presented in the internal raport.

- *Design techniques of networks with optimally reliable structures in the presence of line failures*

This work was devoted to the synthesis of reliable networks when nodes are perfect and links fail independently with the same probability. All Terminal Reliability (ATR) model is used. When links are highly reliable the solution to the problem is known: it is a class of the so-called super-lambda graphs. In this project we concentrated on networks that are optimal independently on the links quality: regular super-lambda graphs are searched for a graph that maximizes network reliability when links are very unreliable. Contrary to the approach of other authors we do not solve the problem analytically but use discrete optimisation techniques and obtain suboptimal solutions, that most probably are very close to the optimal ones. The results were presented at the International Conference on Circuits and Systems (ISCAS'2000) and published in the conference proceedings: "Synthesis of reliable networks in the presence of link failures". A paper entitled: "Maximization of the number of spanning trees in circulant graphs", was submitted to Networks.

[Pro8] **The Elaboration of the Method and Computer Programmes for Determination of Resonant Frequencies of Multilayered Microwave Resonators with Girotopic Media** (Opracowanie metody oraz programu komputerowego wyznaczania częstotliwości własnych wielowarstwowego rezonatora mikrofalowego zawierającego ośrodki żyrotropowe).

Krzysztof Derzakowski, Ph.D.,
27.07.99 - 30.04.2000

The work results in new method for computation of resonant frequencies of multilayered microwave resonators containing isotropic and girotopic media. The radial mode matching method as the most

accurate for this purpose has been used. The method allows to obtain resonant frequencies of all modes in this resonator. On the base of this method the computer programme has been elaborated. This programme allows to determine the resonant frequencies as well as the value of determinate of the matrix described a structure. The results obtained by means of this programme have very good agreements with results shown in literature.

[Pro9] **High-Frequency Class-D Tuned Power Amplifiers with Load Variation** (Rezonansowe wzmacniacze mocy wielkiej częstotliwości klasy D w warunkach zmiennego obciążenia).

Jan Ebert, Prof., D. Sc.,

M. Mikołajewski, J. Modzelewski, A. Owczarek, A. Wajs
27.07.99-30.04.2000

The project deals with effects of load-resistance variation in Class-D tuned power amplifiers. The basic Class-D tuned power amplifier can operate safely only if its load resistance is equal to or higher than the optimum value but its efficiency decreases when the load resistance increases. In the project it was proved that the load resistance of an improved high-efficiency version of Class-D tuned power amplifier (called the Class-D_U Zero-Voltage Switching (ZVS) amplifier) can be varied safely in a wide range from zero to the optimum value. When the load resistance is lower than the optimum value the Class-D_U ZVS amplifier operates in the suboptimum conditions and its efficiency is only slightly lower than the efficiency in the optimum conditions (e.g. 95% compared to 98%). In the project the load characteristics of Class D_U ZVS amplifier were calculated and the experimental Class-D_U ZVS power (200W) amplifier was built and tested.

[Pro10] **Novel Methods of Computer Measuring Systems Designing** (Nowoczesne metody projektowania komputerowych systemów pomiarowych).

Wiesław Winiński, Ph.D.,

K. Adamowicz, P. Bobiński, R. Leoniak, R. Łukaszewski
27.07.99 - 30.04.2000

The main objectives of the project are related to applications of novel integrated software tools in measuring systems designing, as well as to design of new software tools. A new concept of designing distributed measuring systems using JAVA was worked out. The system for monitoring of metodological parameters via Internet using "sockets" was designed. The measuring system for carrier frequency offset measurement of radio and TV transmitters was designed. The concept of self-testing radiomonitoring system was proposed. The simulator of IEC-625.1 measuring systems was worked out. The results were published in five conference papers.

[Pro11] **COMPASS Experiment - Design of the Apparatus and Software Development** (Eksperyment COMPASS - budowa aparatury i przygotowanie oprogramowania).

Krzysztof Zaremba, Ph.D.,
06.01.99 - 30.04.2000

The project is complementary for the [Pro42]. The research work was concentrated mainly on the following subjects:

- design and optimisation of the straw chamber construction;
- design of the measurement system for semi-automatic tests of the components of the Front-End Electronics system;
- design and optimisation of the readout system.

Projects granted by the Rector

[Pro12] **Neural Algorithms for Compression of Multimedia Information** (Neuronowe algorytmy kompresji informacji multimedialnej).
Władysław Skarbek, Prof., D.Sc.,
 A. Pietrowcew, P. Sokolowski
 01.06.99 - 31.05.2000

Multimedia information consists of many signals with different properties. Each of them is encoded/compressed with proper algorithm. All these algorithms are different because signals are different. This work shows possibilities how to use the same procedures of algorithm for compression of two different signals such as image and sound. Modified Oja-RLS (MOR) neural algorithm is used for approximation the KLT transform in two modes: off-line (MORF) and on-line (MORN). MORF algorithm is more suitable for image and audio file compression while on-line audio is processed by MORN algorithm. It appears that for images of natural scenes, the new scheme outperforms significantly JPEG standard: at the same bit rates it gives up to two decibels increase of PSNR measure while at the same image quality it gives up to 50% lower bit rates. For audio data the proposed scheme gives results comparable with existing standards with higher performance for speech data streams.

[Pro13] **Algorithms of Optimised Data Representation Assignment Applied to Archiving and Transmission of Medical Image Data** (Algorytmy wyznaczania optymalnej reprezentacji danych w zastosowaniu do archiwizacji i transmisji medycznych danych obrazowych).
Artur Przelaskowski, Ph.D.,
 01.06.99 - 31.05.2000

Three topics of the research are as follows: wavelet-based image compression, reversible image compression and image quality evaluation measures. Wavelet algorithms are developed to approach JPEG 2000 paradigm, mostly to control the progressive and embedded data streams. Reversible filter banks were tested to fulfil the reversible restoration condition of medical images. Other lossless coders are based on data prediction and interpolation, conditional probability models for arithmetic coding, multidimensional context quantization and formulation. They are adaptive and fitted to medical image characteristic. Reconstructed images from compression process are evaluated in terms of diagnostic accuracy and psychovisual high quality preserving. We proposed vector quality measure with scalar equivalent for sufficient error

characteristics and comparison tests. It is possible to estimate acceptable compression ratio for compressed medical images and to choose the best lossy coder for each image in terms of their accuracy supporting. The assumptions, theory, considerations, experiments and conclusions of conducted research are presented in 12 publications (journal and conference) and are collected in the four fundamental parts of prepared dissertation.

[Pro14] **Optimisation of a Resonant h.f. Class E Amplifier Operating with Variable Load** (Optymalizacja rezonansowego wzmacniacza klasy E wielkiej częstotliwości w układach o zmiennej impedancji obciążenia).
Mirosław Mikołajewski, Ph.D.,
 01.06.99 - 31.05.2000

An analysis and optimisation of a resonant Class E amplifier operating in circuits with varied load have been done. Optimum and suboptimum areas of the amplifier operation have been identified. Normalized characteristics of the amplifier basic electrical parameters such as transistor power losses and its maximum voltage, resonant circuit current amplitude etc vs. normalized impedance load have been found, which allows calculating parameters of the amplifier for a given impedance load. Obtained results will be applied in design procedure of circuits with Class E amplifiers such as resonant dc/dc converters and induction heaters.

[Pro15] **Application of Time-Frequency Representations for Detection and Measurement of Radiocommunication Signals in the Presence of Interference** (Wykorzystanie przekształceń czasowo-częstotliwościowych do detekcji i pomiarów sygnałów radiokomunikacyjnych w obecności zakłóceń).
Adam Fiok, Prof., D.Sc.,
 J. Cichoński, J. Kołakowski, D. Grabowski,
 S. Maszczyk
 01.06.99 - 31.05.2000

The project was focused on development of methods and algorithms for estimation of instantaneous frequency and de-noising. Proposed algorithms are based on wavelet transform. Frequency is estimated from location of wavelet transform modulus maxima. De-noising procedures utilise modified thresholding algorithms. Numerous computer simulations as well as experiments with signals generated with real radiocommunication equipment were used for verification of proposed algorithms. A specialised computer controlled measured system was developed in order to perform experiments. The project resulted in Matlab software supporting investigation of noisy signals and C++ software for measurement system control.

[Pro16] **Microwave High Power Amplifiers Design Using the Dependence of Elements of MESFET Transistor Equivalent Circuit on Power Level** (Projektowanie mikrofalowych wzmacniaczy dużej mocy z uwzględnieniem zależności elementów schematu modelu

tranzystora MESFET od amplitudy sygnału sterującego).

Tadeusz Morawski, Prof., D.Sc.,
W. Wojtasiak, J. Zborowska, D. Gryglewski, R. Michnowski, M. Kukier
01.06.99 - 31.05.2000

High power amplifiers are applied for radiocommunication, radiolocation and the guiding of moving objects systems. The main problem of power amplifiers design amounts to achieve the compromise between maximum output power level and very small amplitude and phase distortion level acceptable for given application. The high power GaAs MESFET model (based on well known small signal MESFET model) has been worked out. The model permits to minimise of AM-AM and AM-PM conversion for output power up to 1dB compression point during the simulation. The model was favourably verified during the design of two power amplifiers with $P_{1dB}=0.8W$ and $P_{1dB}=10W$.

[Pro17] **Methodology for Measuring Systems Design Using Graphical Integrated Software Environments** (Metodyka projektowania komputerowych systemów pomiarowych z wykorzystaniem graficznych, zintegrowanych środowisk programowych).
Wiesław Winiński, Ph.D.,
K. Adamowicz, P. Bobiński, R. Leoniak, R. Łukaszewski
01.06.99 - 31.05.2000

Problems concerning software engineering in measuring systems designing were presented. Graphical software environments for measuring systems designing were analysed. Methodology for measuring systems designing using these environment was proposed. The results were published in three conference papers.

[Pro18] **Radiocommunication and Multimedia Satellite Systems.** (Satelitarne systemy radiokomunikacyjne i multimedialne).
Modelski Józef, Prof., D.Sc.,
T. Krzymień
01.06.99 - 31.05.2000

Basic feature of the new satellite multimedia systems have been analysed. The concept of the first Polish geostacionar system POLSTAR and its possible applications have been described.

Projects granted by the Dean

[Pro19] **Design of Broad-Band High-Power Microwave Amplifiers** (Projektowanie szerokopasmowych mikrofalowych wzmacniaczy dużych mocy).
Tadeusz Morawski, Prof., D.Sc.,
W. Wojtasiak, J. Zborowska,
D. Gryglewski, R. Michnowski, M. Kukier
02.07.99 - 31.05.2000

Methods of broad-band power amplifier design were elaborated. The A-class pulsed amplifier using GaAsMESFET transistor working at very broad frequency band (1.2 - 2 GHz) with 10 W output power was constructed and successfully tested.

[Pro20] **Design and Construction of Research Stand for Designing of the Specialized Digital Audio Filters Based on Digital Signal Processors** (Opracowanie i wykonanie stanowiska badawczego do projektowania specjalizowanych fonicznych filtrów cyfrowych realizowanych techniką DSP).
Zbigniew Kulka, Prof., D.Sc.,
A. Leszczyński, P. Nykiel

The project deals with an application of a 32-bit SHARC digital signal processor for designing and real time implementation of the specialized digital audio filters. The ADSP-21065L EZ-LAB Evaluation Board used in conjunction with VisualDSP is briefly described. Theoretical basis of sampling rate converter systems realized with use of the polyphase digital filter structures are shortly considered. With a help of QEDesign 2000 and Sample Rate Converter System three type of the interpolation digital filters were designed and implemented. The objective and subjective test results of the filters are presented. Finally, the sound quality aspects from point of view of perceived spatial resolution and virtual sound sources localization were discussed.

[Pro21] **The Multimode Method for Measurements of Material Parameters at Microwave Frequencies** (Wielorodzajowa metoda pomiaru parametrów materiałów na częstotliwościach mikrofalowych - etap II).
Krzysztof Derzakowski, Ph.D.,
A. Abramowicz, J. Krupka, J. Modelski
02.07.99 - 31.05.2000

The work results in a new multimode method of complex permittivity measurements at microwave frequencies. Elaborated optimal structures, the set of used resonant modes, the measuring procedure as well as the computer programmes have been given. The structure consists of the open dielectric resonator with the ratio of a diameter to a height about 10, operating in Whispering Gallery modes with small azimuthal numbers (5,6,7). An easy recognition of the WG modes in this structure makes possible the measurements of the sample permittivity with very high accuracy. Three papers presented at 6th International Conference on Electromagnetics for Advanced Applications (Torino), 13th International Conference on Microwaves, Radar and Wireless Communications (Wrocław) and International Conference on Signals and Electronic Systems (Ustroń) describing results of the work have been written.

[Pro22] **Diagnostics of Linear Systems with Ambiguity Groups of Parameters** (Diagnostyka systemów liniowych z niejednoznaczными grupami parametrów).
Jacek Wojciechowski, Prof., D.Sc.,
V. Brygilewicz
02.07.99 - 31.05.2000

A multi-testing method for parameter identification in analog linear systems, which allows for solving the problem of ambiguity in time and frequency domains, has been proposed. The first step is a classical testing: excitations are applied consecutively to the accessible and responses measured at partly

accessible nodes. Diagnosis of parameters is performed using the sensitivity matrix approach. If the column order of sensitivity matrix is smaller than the number of parameters to be identified, than ambiguity groups appear, and identification of parameters is not unique. In the second step additional tests, to increase the column rank of sensitivity matrix, are performed. Successively, to each of the accessible and partly accessible nodes an additional passive element is connected and tests performed until sensitivity matrix is full of order. The method has been implemented as a set of computer programmes and tested on benchmark examples. The results were presented at the XXII-nd Intl. Conf. on Fundamentals of Electrotechnics and Circuit Theory (IC-SPETO 2000) and published in the conference proceedings: *Parameters identification of linear circuits with ambiguity groups*.

[Pro23] **Computer Test Set for Subjective and Objective Assessment of the Quality of Television Picture for Compressed Systems** (Komputerowe stanowisko do subiektywnego i obiektywnego badania jakości obrazu telewizyjnego w systemach z kompresją).
Tomasz Krzymień, M.Sc.,
02.07.99 - 31.05.2000

Analysis of the test sequences generation by personal computer for subjective assessment according to ITU recommendations was presented. Various methods of recording television pictures on hard drives incorporating video capture cards for non-linear editing were discussed. In paper were also defined requirements for these systems at television measurements. Finally Pentium II computer was equipped with Truevision Targa 1000 Pro video disc recorder and 18.3 GB AV hard drive. Near broadcast quality suitable for initial purposes was achieved due to low compression ratio and fast drive data rate.

[Pro24] **Propagation of the Electromagnetic Waves in the Theory of Bellert** (Propagacja fal elektromagnetycznych w świetle teorii Bellerta).
Jacek Jarkowski, Ph.D.,
02.07.99 - 31.05.2000

Bellert explains in his theory the phenomena of the Red Shift observed by astronomers since 1928. He discusses the open space properties and develops equation which describes changes of travelling electromagnetic wave length on long distances in the Universe. In the project the properties of electromagnetic wave itself was discussed.

[Pro25] **Virtual Laboratory Accessible via Internet** (Wirtualne laboratorium w Internecie).

Władysław Skarbek, Prof., D.Sc.,
02.07.99 - 31.05.2000

P. Bobiński, A. Buchowicz, G. Galiński, K. Ignasiak, T. Jamrógiwicz, D. Janusek, M. Kazubek, Z. Kulka, M. Łempkowski, R. Łukaszewski, J. Mirkowski, K. Mroczek, L. Padee, R. Pączkowski, A. Pietrowcew, A. Przelaskowski, P. Sokołowski, W. Winiecki
02.07.99 - 31.05.2000.

The goal of this research is the development of a

Virtual Laboratory at our Faculty, i.e. an information system devoted for remote access in Internet to chosen lab devices and unique computational services. In the second year the following tasks have been implemented:

- Management system for Internet access to devices and remote services;
- Development of MOR algorithm;
- Archivisation of measurement data;
- Adding synchronisation features for data from different sources;
- GUI design for control interfaces;
- Dialog audio groups.

[Pro26] **Capacitance Tomograph Mode** (Model tomografu pojemnościowego).

Jacek Mirkowski, Ph.D.,
02.07.99 - 31.05.2000

Design, construction and principle of operation of an experimental electrical impedance tomography system, developed at the Medical Imaging Research Group of Institute of Radioelectronics, Warsaw University of Technology, are described. The system has modular construction and programmable control architecture. It uses two sets each of up to 16 electrodes, or single set of up to 32 electrodes for contactless measurements of the distribution of electrical parameters inside measured media. Complex impedance or its components (electrical conductivity, electrostatic permittivity) can be measured and one or two tomographic images reconstructed. Standard personal computer system is utilized for system control and image reconstruction. The work outlines the principles and peculiarities of electrical impedance tomography, as well as hardware and software system design and software simulations performed. The system is intended for experimental survey of the capabilities and limitations of electrical impedance tomography techniques, as well as for industrial measurements of processes of transport, mixing, separation and combustion (including explosive combustion) and structure of materials, primarily in chemical process engineering and material engineering.

[Pro27] **Teleradiological System for Computer-Aided Diagnostics of Breast Cancer on the Basis of the DICOM Standard** (Teleradiologiczny system wspomaganie diagnostyki raka piersi w oparciu o standard DICOM).

Waldemar Smolik, Ph.D.,
02.07.99 - 31.05.2000

The equipment base for the teleradiological system was prepared in the framework of this project. Most of the system elements were build using the equipment of Division of Nuclear and Medical Electronics. The conception of telemedical system for computer-aided diagnostics of breast cancer using mammography was elaborated. Software for mammographic data import using the DICOM standard was worked out and made. The Internet system which makes possible access to the mammographic data by the Internet was elaborated. The procedures for digitalization of X-ray film were elaborated. The certain number of mammographic studies was acquired. The "intelligent" method of

mammogram presentation was worked out.

- [Pro28] **T-wave Analyses Using High-Resolution ECG** (Analiza załamka T metodami elektrokardiografii wysokiej rozdzielczości).
Adam Piątkowski, Prof., D.Sc.,
02.07.99 - 31.05.2000

The aim of our study was to assess the optimal method for T-wave detection and description. Five different methods for automatic detection of begin and end of T-wave was tested. The aim of our study was to assess the optimal method for T-wave detection and description. Five different methods for automatic detection of begin and end of T-wave was tested. Several different parameters were calculated for each patient and each type of filtration. For statistical analyses we need more data and this work was held in Medical Academy.

- [Pro29] **New Types of Antennae and Methods of Their Design and Measurement** (Nowe rodzaje anten, metody ich projektowania i pomiarów).
Józef Modelski, Ph., D.Sc.,
H. Chaciński, M. Celuch-Marcysiak,
W. Gwarek, J. Jarkowski, Y. Yashchishyn, M. Piasecki, S. Rosłonec
02.07.99 - 31.05.2000

Currently antenna engineering is the most important area of radioelectronics and telecommunications, because a wireless telecommunication and radiolocation systems development is very fast. This project makes the first stage of the realization of the whole investigation program in the Institute of Radioelectronics. In this project strategy of the antenna engineering development is elaborated and a concept of the professional antenna laboratory for the investigation of radioelectronic devices in the mm-wave range is presented. The important element of this project is also a concept of a new type of the microstrip antenna on the multilayered substrate. The results indicate that this approach has many advantages, is very practical and promising. It gives possibilities of several applications, e.g. in smart antennas. Moreover the methods of the simulation and measurement of different microwave structures are elaborated. Performed measurements include estimating influence of parameters of an antenna measurement range on a radiating pattern of the antenna of the radar equipment EDYTA-M and protection methods for array radar antennas. The research work covered in the project resulted in five conference papers and three internal reports.

Priority grants

- [Pro30] **An Accessory for Ultrasound Imaging System for Three-Dimensional Breast Examination** (Przystawka do aparatu USG umożliwiająca trójwymiarowe badanie piersi).
Marian Kazubek, Ph.D.,
J. Mirkowski, A. Przelaskowski, T. Jamrógiewicz, L. Padee
30.08.99 - 31.05.2000.

The purpose of this project was elaboration of

system, which will enable spatial (three-dimensional) research of breast using ultrasound method. Discovering of tumor changes was the main objective of this project.

- [Pro31] **Optimization of the Bone Density Scanning System** (Optymalizacja aparatury do skaningowych badań gęstości tkanek kostnych).
Janusz Marzec, Ph.D.,
G. Domański, Z. Pawłowski, K. Zaremba,
B. Konarzewski, A. Borecki
30.08.99 - 31.05.2000.

The optimization of the scanning system with scintillating head was performed. The minimization of radiation dose for fixed precision was the main criterion of the optimization. Influence of each stage on total random error of Bone Mineral Density measurement was found. The results of scanning system parameters measurements in a typical bone mineral density measurement conditions were presented. It was proved that random error of bone density measurement in a typical conditions is less than 2%.

- [Pro32] **Research Workstation for Visualisation and Analysis of Brain and Miocardium Functional SPECT Tomographic Studies** (System do wizualizacji i badań tomografii emisyjnej dla diagnostyki mięśnia sercowego i badań funkcjonalnych mózgu).
Roman Szabatin, Ph.D.,
P. Brzeski, J. Mirkowski, T. Olszewski,
W. Smolik
30.08.99 - 31.05.2000.

Two sophisticated clinical programs named *POLARMAP* and *ECTBRAIN* have been elaborated as a result of the grant. They make reconstruction of the tomographic cross sections and make full analysis of patient gammacamera SPECT studies. The *POLARMAP* program creates, on the basis of transversal heart sections, the polar-map and calculates quantity factors from rest and stress phases and from the difference between the phases and the standard studies.

The *ECTBRAIN* program analyses the distribution of the ⁹⁹Tc-HM-PAO radioisotope in anatomical region of the brain aorta vessels. It compares activity of the isotope in symmetrical parts of the brain.

- [Pro33] **MRI Tomography Simulator** (Symulator ekspozycji w tomografie Rezonansu Magnetycznego).
Adam Piątkowski, Prof., D.Sc.,
30.08.99 - 31.05.2000.

The purpose of the project was to create and test procedures for imaging of blood flow in large vessels. The phantom of left ventricle of heart was created in order to verify mentioned procedures. Based on the theoretical analysis of the MR sequences an application called „Exposition simulator” was created. It can visualize the contrast of the image depending on the parameters of the sequence. Equations for gradient echo sequences are more complicated then for spin echo. Using only PC computer the time of reaction for exposition simulator was too long. The problem was solved by implementation of most time

critical procedures on the digital signal processor. Looking further ahead, the phantom can be used to calibrate MR quantitative examination of flow in heart and large vessels.

4.2. Projects granted by the State Committee for Scientific Research (KBN)

[Pro34] **Resonant h.f. Converters with Synchronous Regulators** (Rezonansowe przetworniki energii wielkiej częstotliwości z regulatorami synchronicznymi).
J. Ebert, Prof. D.Sc.,

A. Wajs

01.06.2000-31.05.2001

Research concerns the following topics:

- Analysis and optimisation of novel resonant h.f. ZVS synchronous regulators circuits operating with a constant frequency and with different kinds of loads e.g.: a resistance, a series resonant circuit and a load with rectifier;
- Elaboration of designing procedures of resonant h.f. converters with synchronous regulators and resonant Class E amplifier applied as a h.f. energy source;
- Practical verification of the laboratory models of the proposed circuits.

[Pro35] **Enhancement of the Efficiency of Time-Domain Electromagnetic Analysis of 3 D Microwave Circuits by Application of Multi-Thread Programming Techniques**

(Poprawa efektywności analizy elektromagnetycznej w dziedzinie czasu trójwymiarowych obwodów mikrofalowych poprzez zastosowanie technik programowania wielowątkowego).

Wojciech Gwarek, Prof., D.Sc.,

M. Sypniewski, A. Więckowski, P. Miazga, M. Celuch-Marcysiak

1.07.98 - 31.12.2000.

Electromagnetic modelling group of the Institute has developed advanced methods of computer-aided analysis of microwave circuits applied in practice in industry and research. Recent trends in development of popular PC computers make multiprocessor machines more and more popular. The main aim of the project is to adapt the programming techniques used in electromagnetic modelling to make the most effective use of such machine.

[Pro36] **Multidimensional Wigner Distributions and Ambiguity Functions for Analytic Signals. The Extension of the Theory and Applications** (Wielowymiarowe rozkłady Wignera i funkcje nieoznaczności dla sygnałów analitycznych. Rozwinięcie teorii oraz zastosowania).

Stefan Hahn, Prof., D.Sc.,

J. Jarkowski, K. Snopek, G. Hahn

23.06.99 - 31.12.2001.

The Wigner distribution of n -dimensional complex signals was firstly defined in 1932. The subject of the

project is to study the properties of this distribution for n -dimensional analytic signals defined in 1992 by S. Hahn. The n -D Wigner distribution is related by a $2n$ -D Fourier transformation to the n -D ambiguity function. In the theory of radiolocation the 2-D ambiguity function is known as the Woodward function. The purpose of the project is to find practical applications of 4-D Wigner distributions and 4-D ambiguity functions. The visualisation of 4-D functions will be performed using the animation technique given, for example, by Matlab.

[Pro37] **Optimization of High-Efficiency High-Frequency dc/dc Converters** (Doskonalenie wysokosprawnych przetwornic napięcia stałego z przetwarzaniem energii wielkiej częstotliwości).

Miroslaw Mikołajewski, Ph.D.,

J. Ebert, K. Puczek, A. Wajs, A. Owczarek

01.06.2000 - 31.05.2001

The project concerns an analysis and optimization of high-frequency high-efficiency resonant dc/dc converters with synchronous regulators. Measurement of selected soft ferrites for determinations of their power losses in the MHz range will also be made. Methods of designing planar inductors and transformers will be proposed. Novel dc/dc converters will be verified experimentally.

[Pro38] **Wavelet-Based low-Bit Rate Hybrid Video Coding** (Kodowanie sekwencji obrazów z dużym stopniem kompresji z zastosowaniem analizy wielorozdzielczej).

Józef Modelski, Prof., D.Sc.,

G. Siemek

1.06.2000 - 1.08.2001

The purpose of this work is to check the applicability of the wavelet transform for coding the motion compensated signal error in the block-based hybrid video coding scheme. In related publications the wavelet transform was performed on the whole motion compensated frames. For the low bit rates such solution produces poor results because in well motion compensated regions the residual signal is small, thus transformed and quantized to zero. In our approach the wavelet transform is performed on the block basis. The transform coefficients are coded with the embedded strategy. The work includes the research on the optimal video coder syntax, video coding algorithms and bit rate allocation strategy.

[Pro39] **Algorithms for Digital Signal Processing of Measurement Data, Dedicated to Applications in Environmental and Industrial Monitoring** (Algorytmy cyfrowego przetwarzania danych pomiarowych dla zastosowań w monitoringu środowiska naturalnego i w monitoringu przemysłowym).

Roman Z. Morawski, Prof., D.Sc.,

A. Miękina, A. Podgórski

10.12.99 - 30.06.2002

The project is on the methods and algorithms of digital signal processing of measurement data, aimed at the solution of some fundamental problems related to the development of information infrastructure of environmental and industrial

monitoring, such as:

- expanding the set of measurable quantities;
- improving the resolution, accuracy, speed or reliability of measuring quantities important for monitoring;
- decreasing the costs of instrumentation via its specialization or software substitution of its hardware.

The research goal of the project is to develop new algorithms for measurand reconstruction and calibration of measurement channels, making it possible to analyse multicomponent substances, i.e. to determine the estimates of concentrations, as well as uncertainties of those estimates, on the basis of:

- spectrophotometric data;
- data provided by selected sensors and transducers used in monitoring.

The results of the research accomplished have been presented in several papers [Pub31], [Pub36], [Pub37], [Pub93], [Pub107], [Pub136], [Pub141].

[Pro40] **Optimisation of Radiographic Imaging Sensors Dedicated for Osteoporosis Dignostics** (Optymalizacja sensorów obrazów do radiograficznych systemów obrazowania przeznaczonych do diagnozowania osteoporozy).
Zdzisław Pawłowski, Prof., D.Sc.,
J. Marzec, K. Zaremba, B. Konarzewski, G. Domański, E. Demczuk
14.07.2000 - 30.06.2002.

[Pro41] **Methods of Designing Packet Radio Networks** (Metody projektowania pakietowych sieci radiowych).
Jacek Wojciechowski, Prof., D.Sc.,
Zbigniew Walczak
1.02.2000 - 31.01.2001

The aim of this project is to propose new, more effective methods for designing communication protocols in packet radio networks. A packet network is modeled as a graph and the graph theory is applied to the problem. In such networks conflicts may occur and different methods of access to radio bandwidth are used such as TDMA, FDMA, CDMA. For each of them a combinatorial optimisation problem may be formulated to obtain the best possible parameters of radio network, maximizing the number of packets sent per time unit and avoiding conflicts. Computer experiments are designed and performed to check effectiveness of the proposed methods.

[Pro42] **The Minimization of Temperature Influence on Microwave High Power Amplifier Parameters** (Minimalizacja wpływu temperatury na parametry użytkowe mikrofalowych wzmacniaczy tranzystorowych dużych mocy).
Wojciech Wojtasiak, Ph.D.,
D. Gryglewski, J. Zborowska, S. Żygadło, R. Michnowski, M. Kukier, K. Robaczyński, M. Lubiejewski
1.04.99 - 31.12.2001

The minimization process is based on the self-elaborated temperature-dependent models of high power transistors (MESFET, HBT, etc.). The

temperature is dependent on the transistor equivalent circuit elements from experimental results. They describe long-term thermal effects. The short-term thermal effects have been modelled by means of FDTD method using chip dimensions. In frame of the project, methods of design of microwave high power amplifiers with very stable output power level, gain and minimum transmittance changes over a -40:+60⁰ temperature range have been developed. The verification of the proposed models and methods has been shown an excellent agreement of experimental results with theoretical simulation.

[Pro43] **COMPASS Experiment - Design of the Apparatus and Software Development** (Eksperyment COMPASS - budowa aparatury i przygotowanie oprogramowania).
Krzysztof Zaremba, Ph.D.,
Z. Pawłowski, J. Marzec, B. Konarzewski, G. Domański
09.1999-06.2000

The project was a part of the long-term collaboration of the Institute of the Radioelectronics with the international high energy physics experiment COMPASS (Na58) at CERN (Geneva). The project deals with the design and optimisation of the straw chambers (which are the main components of the large area tracking system in the experiment) and design of the read-out electronics for these detectors. The electrical properties of various cathode materials of the straw tubes were theoretically analysed and tested in the laboratory conditions. As a result of this research new type of the cathode materials was successfully applied in the prototype version of the chamber. The high-voltage supply system was designed and the prototype version was produced and used for the beam tests at CERN. The semi-automatic test system for the fast measurement of main properties of the read-out system components was designed and built.

4.3 Other projects

[Pro44] **Analysis of Exploitation Features of Mobile Radiomonitoring Systems; Development and Verification of the Concept of their Capabilities Extension** (Analiza badań eksploatacyjnych ruchomych systemów radiomonitoringowych oraz opracowanie i weryfikacja koncepcji rozszerzenia ich możliwości metrologicznych - etap I)
Jacek Cichocki, Ph.D.,
J. Kołakowski, D. Grabowski, S. Maszczyk
29.06 - 15.12.2000
Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR).

Results of mobile station field tests as well as users opinions have been gathered and thoroughly analysed. The concept of new improved software version was proposed and discussed.

[Pro45] **Elaboration of Tuning Procedure and Characteristic Optimisation of**

Microwave Diplexers for Radio Links and Tuning of 100 Equipments

(Wykonanie opracowania procedury strojenia i optymalizacji charakterystyk diplexerów mikrofalowych do radiolinii oraz wykonanie przestrojenia 100 sztuk urządzeń)

Krzysztof Derzakowski, Ph. D.

K. Kurek

15.12.99 - 28.02.2000

Fund by Alcatel Polska S.A.

The procedure of tuning of microwave diplexers for radio links working in the range of 2300MHz to 2500MHz is described. The method of the characteristic optimisation is also given. The procedure takes into account the reflection and attenuation characteristics. The characteristics have been measured by means of the HP network analyser.

[Pro46] **Problems of Evaluation of the Digital Broadcasting in the Frequency Band of 150kHz-30MHz** (Zagadnienia rozwoju radiofonii cyfrowej w zakresie częstotliwości od 150 kHz do 30 MHz).

Jacek Jarkowski, Ph.D.,

2.01.99 - 10.12.2000.

Found by National Radiocommunication Agency PAR (Zarząd Agencji Radiokomunikacyjnej ZK PAR).

All aspects of digital broadcasting in frequency range of 150kHz-30MHz are discussed. Special interest was focused on compression methods of audio signals and multilevel modulations. Three systems of digital broadcasting proposed in France, Germany and USA were analysed.

[Pro47] **Design Method of Modernization of Five Specialized Units** (Opracowanie metodyki modernizacji i przeprowadzenie modernizacji pięciu zespołów).

Krzysztof Kowalski, Ph.D.,

15.06 - 10.11.2000

Project developed in cooperation with the Military Institute of Armament Technology (Wojskowy Instytut Techniczny Uzbrojenia).

The five specialised units have been designed and constructed.

[Pro48] **Analysis and Testing of Board Equipment Before Fire Tests and Design of Programme and Methodology**

(Przeprowadzenie analizy i badań aparatury pokładowej przed próbami poligonowymi wraz z opracowaniem programu i metodyki badań).

Krzysztof Kowalski, Ph.D.,

12.05- 15.06.2000

Project developed in cooperation with the Military Institute of Armament Technology (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro49] **Introduction of Some Modifications to Level-Dependent Ear-Muffs due to Utilize Tests and Production of Short Series New Ear-Muffs Prototypes** (Wprowadzenie zmian prototypu

nauszników przeciwhałasowych z regulowanym tłumieniem, wynikających z przeprowadzonych badań użytkowych i wykonanie serii próbnej zmodernizowanych nauszników).

Zbigniew Kulka, Prof., D.Sc.,

14.06 - 15.11.2000

Fund by Central Institute for Labour Protection (Centralny Instytut Ochrony Pracy).

A new variable gain audio amplifier with reduced power supply current consumption was designed and implemented. It uses an AC voltage amplifier preceded with the input attenuator controlled by feedback loop consisting of DC voltage amplifier, full wave rectifier and bipolar transistors. The short series of level - dependent ear-muffs prototypes equipped with new electronics were performed and tested.

[Pro50] **Measurements of THD Distortion of Sound Registered by Means of Panasonic VHS Camera** (Wykonanie pomiarów zniekształceń dźwięku rejestrowanego przez kamerę VHS Panasonic).

Andrzej Leszczyński, Ph.D.,

26.05 - 29.05.2000.

Panasonic Polska Limited Company.

The work deals with measurements of nonlinear distortions (THD &N) introduced by a Panasonic VHF camera type NV-RX67EG. In the first stage, the test tape of the sound signals changing in the function of frequency and level was recorded. The measurements were carried out in the range 70 dB SPL to 110 dB SPL, for 1000 Hz and 4000 Hz.

[Pro51] **The Prototype of Integrated Digital Television Monitoring System Using a Wavelet Coding and its Derivatives for Linux and MSWindows IVT System** (Prototyp zintegrowanego systemu cyfrowego monitoringu telewizyjnego z użyciem kodowania falkowego i jego pochodnych dla systemu Linux i MSWindows IV T).

Władysław Skarbak, Prof., D.Sc.,

1.11.99 - 31.01.2000.

Fund by POLIXEL S.A.

The system called M³S (MultiMediaMonitoring and Surveillance) was implemented for monitoring goals. It uses concepts of hierarchical maps where icons for various digital multimedia data sources and targets, are located. Wavelet coding was applied on both, Windows and Linux platforms.

[Pro52] **Design and Construction of the Unique Research Stand for Process Tomography for Image Reconstruction and Analyses** (Wykonanie unikatowego stanowiska badawczego do PT z komputerem PC do rekonstrukcji i analizy obrazów).

Roman Szabatin, Ph.D.,

1.08 - 30.10.2000

Found by Institute of Organic Industry (Instytut Przemysłu Organicznego).

The Process Tomography (PT) is based on measurement of the electrical parameters such as impedance or capacitance of the object (fluid, mixtures, loose mass, etc.). The main application of the PT is imaging of dynamic technological processes. The goal of the work is to develop the main electronics modules of the process tomograph.

[Pro53] **L and S Band Noise Sources Components Construction and Elaboration** (Opracowanie i wykonanie podzespołów źródeł szumów na pasma L i S)

Wojciech Wojtasiak, Ph.D.,
10.12.99 - 30.06.2000.

Project has been developed to the order of the Military Institute of Armament Technology (Wojskowy Instytut Techniczny Uzbrojenia).

The new version of L and S Band noise sources have been elaborated. The devices were elaborated for radar and control and data transmission system jamming. The L-band power noise source is characterised by $P_{out}=12W$, bandwidth $df=14\%$ and the S-band noise source is characterised by $P_{out}=10W$, bandwidth $df=11\%$.

[Pro54] **S-Band Amplifier with Integrated Noise Source Elaboration** (Opracowanie wzmacniacza na pasmo S zintegrowanego ze źródłem szumów).

Wojciech Wojtasiak, Ph.D.,
8.05-31.10.2000.

Project has been developed to the order of the Military Institute of Armament Technology (Wojskowy Instytut Techniczny Uzbrojenia).

The S-Band Amplifier with Integrated Noise Source has been worked out. The device generates white, Gaussian noise in band 2-4GHz with output power $P_{out}\geq 5W$. The device was elaborated for radar and control and data transmission system jamming.

[Pro55] **The Transmitter and Receiver Circuits Design of C Band T/R Module** (Projekt układów odbiornika i nadajnika do modułu nadawczo-odbiorczego).

Wojciech Wojtasiak, Ph.D.,
20.06 - 30.11.2000

Project developed in cooperation with the Telecommunication Research Institute

(Państwowy Instytut Telekomunikacji).

The Transmitter and Receiver circuits of C band T/R Module for active phased array radar have been designed. The output power at 1dB compression point of transmitter is $P_{1dB}\geq 4W$, and gain is $G\geq 30dB$. The noise figure of receiver is $N_f\leq 3dB$ and gain is $G\geq 25dB$.

4.4. International co-operation

[Pro56] **Video Module Research Project** (Moduł wideo w domowej platformie multimedialnej).

Władysław Skarbek, Prof., D.Sc.,
22.08.2000 - 10.06.2001

Arris Interactive L.L.C, USA

The project is defining next generation telecommunication access systems that will be capable of delivering converged (video, data and voice) and interactive services to residences. It aims at development and demonstration of samples of converged services over a proof-of-concept, state-of-the-art device that resides on the side of the house or inside customer premises.

[Pro57] **Industrial Research Project**
Wojciech Gwarek, Prof., D.Sc.,

17.10.2000 - 30.01.2001

Personal Chemistry A.B, Uppsala, Sweden

5. Consulting

[Cons1] **Opinion of Minister of Telecommunications Draft Order Concerning Terms and the Terms of Payment for Reservation of Frequency and its Usage in Relation to EU Regulations** (Opinia do projektu rozporządzenia Ministra Łączności w sprawie wysokości, terminów i sposobu uiszczania opłat za dokonanie rezerwacji częstotliwości i za prawo do wykorzystania częstotliwości w zakresie zgodności z rozwiązaniami stosowanymi w Unii Europejskiej)

Jacek Wojciechowski, Prof., D.Sc.,

J. Jarkowski

November 2000

6. TITLES AND DEGREES AWARDED

6.1. Professor Titles

- [Prof1] Wojciech Gwarek - promoted to a tenured professor (January 2000).

6.2. Ph.D. Degrees

- [PhD1] Jerzy Kołakowski: „Wykorzystanie transformacji falkowej do oceny emisji nadajników radiokomunikacyjnych w stanach przejściowych” (Application of wavelet transform for evaluation of radiocommunication transmitter emissions during transient states), Prof. **A. Fiok** / **J. Modelski** (tutors), Warsaw 2000.

6.3. M.Sc. Degrees

- [MSc1] Grzegorz Andrejuk: „Filtr mikrofalowy z zastosowaniem rezonatorów dielektrycznych” (The microwave filter with dielectric resonators), Assist. Prof. **K. Derzakowski** (tutor), (4).
- [MSc2] Grzegorz Baran: „Automatyczne systemy do pomiaru anten radarowych” (Automatic systems for measurement radar antennae), Prof. **J. Modelski** (tutor), (5).
- [MSc3] Rafał Brzyski: „System komunikacji dla osób niepełnosprawnych oparty na analizie ruchów gałki ocznej” (An eye movement communication system for the disabled), Assist. Prof. **T. Buczkowski** (tutor), (5), (honours).
- [MSc4] Marcin Buława: „Implementacja biblioteki komunikacyjnej w standardzie DICOM 3.0” (Implementation of the communication library operating the connections in DICOM 3.0 standard), Assist. Prof. **R. Szabatin** (tutor), (4.5).
- [MSc5] Marcin Byczot: „Stanowisko do badania łącza radiowego w paśmie ISM” (Test bench for testing a radio link in ISM band), Assist. Prof. **T. Buczkowski** (tutor), (4.5).
- [MSc6] Michał Chłapiński: „Planowanie częstotliwości w sieciach telefonii komórkowej GSM” (Frequency channels allocation in GSM networks), Assist. Prof. **T. Kosiło** (tutor), (5), (honours).
- [MSc7] Tomasz Ciamulski: „Program do analizy połączeń wielowrotowych układów mikrofalowych” (Programme for analysis of multiport microwave structures) Prof. **W. Gwarek** (tutor), (5).
- [MSc8] Rafał Czapski: „Weryfikacja pomiarowa wzorów stosowanych do obliczeń rozkładu pola elektromagnetycznego o wartościach granicznych stosowanych w przepisach o

ochronie ludzi i środowiska naturalnego w oparciu o pomiary systemów antenowych stacji bazowych pracujących w systemie GSM” (Measuring verification of models applied to estimate disposition of the electromagnetic field reaching values applied in regulations related to the safety of human and natural environment supported by measurements of antenna installation working in GSM cellular network), Assist. Prof. **J. Jarkowski** (tutor), (5).

- [MSc9] Jarosław Czerniawski: „Dekompozycja obrazów cyfrowych za pomocą transformaty falkowej” (Digital image decomposition by means of a wavelet transform), Assist. Prof. **A. Buchowicz** (tutor), (4).
- [MSc10] Przemysław Czuba: „Prezentacja obrazowych danych medycznych standardu DICOM w systemach komputerowych” (Presentation of medical image data for DICOM standard in computer systems), Assist. Prof. **R. Szabatin** (tutor), (5).
- [MSc11] Krzysztof Dembowski: „Bezprzewodowa transmisja danych z wykorzystaniem techniki modulacji z widmem rozproszonym” (Wireless data transmission with Spread Spectrum modulation), Assist. Prof. **T. Kosiło** (tutor), (4.5).
- [MSc12] Tomasz Drosio: „Przetwarzanie i analiza obrazowych danych medycznych standardu DICOM” (Conversion and analysis of imaging medical data in DICOM standard), Assist. Prof. **R. Szabatin** (tutor), (5).
- [MSc13] Andrzej Drzewiecki: „Planowanie łącza radiowych na potrzeby telefonii komórkowej” (Planning of radio relay systems for cellular networks), Assist. Prof. **T. Kosiło** (tutor), (5).
- [MSc14] Adam Duda: „Stanowisko do dwusygnałowych pomiarów odbiorników radiokomunikacyjnych FM” (The set for dualsignal measurements of radio-communication FM receivers), Assist. Prof. **J. Cichocki** (tutor), (5).
- [MSc15] Mariusz Działak: „Analiza właściwości akustycznych w pomieszczeniach kontrolnych studiów nagraniowych” (Analysis of the acoustic conditions of control rooms in the recording studios), Assist. Prof. **M. Tajchert** (tutor), (4).
- [MSc16] Krzysztof Ebert: „Reprezentacja obiektów multimedialnych w standardzie MPEG-4” (Representation of multimedia objects in

- MPEG-4 standard), Prof. **W. Skarbek** (tutor), (4.5).
- [MSc17] Paweł Garbacz: „*Impulsowy wzmacniacz mocy do nadajnika IFF*” (Impulse power amplifier for IFF transmitter), Assist. Prof. **W. Wojtasiak** (tutor), (4).
- [MSc18] Mariusz Gil: „*Algorytmy wykrywania krawędzi w cyfrowych obrazach kolorowych*” (Algorithms for detection the edge in digital colour images), Assist. Prof. **A. Buchowicz** (tutor), (3.5).
- [MSc19] Artur Głębocki: „*Programowalny odbiornik radiowy systemu DGPS*” (The software-defined DGPS radio receiver), Assist. Prof. **T. Buczkowski** (tutor), (4).
- [MSc20] Tomasz Gontarek: „*Automatyzacja pomiarów radiokomunikacyjnych z wykorzystaniem zintegrowanego środowiska programowego LabWindows/CVI*” (Automation of radio communication measurements using integrated environment LabWindows/CVI), Assist. Prof. **W. Winiecki** (tutor), (5).
- [MSc21] Norbert Grzech: „*Technika Active Contour Model w obrazowaniu medycznym*” (Active Contour technique in medical imaging), Assist. Prof. **M. Kazubek** (tutor), (4.5).
- [MSc22] Krzysztof Jankowski: „*Akwizycja danych z gammakamery*” (Data acquisition from gammacamera), Assist. Prof. **R. Szabatin** (tutor), (5).
- [MSc23] Paweł Marcin Janowski: „*Rezonansowa przetwornica napięcia stałego z prostownikiem synchronicznym klasy Dc*” (Resonant dc/dc converter with synchronous class Dc rectifier), Assist. Prof. **M. Mikołajewski** (tutor), (5).
- [MSc24] Tomasz Jardzioch: „*Rezonansowy wzmacniacz klasy D_U ZVS o mocy 1kW*” (1kW-output-power Class D_U ZVS tuned amplifier), Assist. Prof. **J. Modzelewski** (tutor), (4.5).
- [MSc25] Piotr Jarosz: „*Studio nagrań dźwiękowych Zakładu Elektroakustyki - analiza możliwości i realizacja sprzętowa*” (Recording studio of the Electroacoustics Division - possibilities analysis and equipment configuration), Assist. Prof. **A. Leszczyński** (tutor), (4.5).
- [MSc26] Michał Karkowski: „*Wykorzystanie techniki Java do projektowania rozproszonych systemów pomiarowo-kontrolnych*” (Using Java technology in designing distributed measurement systems), Assist. Prof. **W. Winiecki** (tutor), (5).
- [MSc27] Paweł Kaćki: „*Kanał radiokomunikacyjny dla służby stałej lądowej: właściwości, modelowanie, eliminacja zakłóceń*” (Radiocommunication channel for land service: properties, modelling, cancellation of distortion), Assist. Prof. **T. Kosiło** (tutor), (4.5).
- [MSc28] Jarosław Kiemel / Marek Chmielewski: „*Projekt i realizacja studia postproducyjnego telewizji HBO Polska*” (The technical project of the postproduction facility for the HBO Polska television channel), Prof. **J. Modelski** (tutor), (5).
- [MSc29] Robert Kołodziejczyk: „*Komunikacja sieciowa w standardzie DICOM - implementacja standardu w oparciu o bibliotekę DICOM DUL*” (DICOM network implemented on the basis of library DICOM DUL), Assist. Prof. **R. Szabatin** (tutor), (4).
- [MSc30] Bartosz Kosior / Paweł Matracki: „*Analiza systemu radiowego dostępu abonenckiego pracującego w standardzie CT2*” (Analysis of the access network systems working in CT2 standard), Assist. Prof. **T. Kosiło** (tutor), (5).
- [MSc31] Robert Kurjata: „*Modułowy system monitorowania wykorzystujący magistralę VSB - moduł pulsoksymetru*” (The modular system of monitoring using VSB magistral - pulsoksymeter module), Assist. **T. Jamrógiewicz** (tutor), (5).
- [MSc32] Grzegorz Kustra: „*Badanie i analiza właściwości akustycznych pomieszczeń*” (Research and analysis of acoustic properties in different rooms), Assist. Prof. **J. Narkiewicz-Jodko** (tutor), (4.5).
- [MSc33] Jarosław Lange: „*Minimalizacja zmian fazy transmitancji wzmacniaczy z tranzystorem GaAsMESFET*” (Limitation of the transmittance deviation for an amplifier with a GaAsMESFET transistor), Assist. Prof. **W. Wojtasiak** (tutor), (5).
- [MSc34] Piotr Łyszcz: „*Charakterystyka ukrwienia serca i mózgu z wykorzystaniem dynamicznych badań tomograficznych CT*” (Cardiac and cerebral blood flow imaging based on dynamic CT scanning protocols), Assist. Prof. **A. Przelaskowski** (tutor), (5).
- [MSc35] Wojciech Maciejuk: „*Trójwymiarowe obrazowanie struktur wewnętrznych przy pomocy ultradźwięków*” (Three dimensional imaging of internal structures by means of ultrasonic methods), Assist. Prof. **A. Przelaskowski** (tutor), (4).
- [MSc36] Andrzej Mędrzak: „*Część odbiorcza radiowego detektora wyładowań atmosferycznych umieszczonego na pokładzie satelity*” (Receiving part of a thunderstorm detector located on the satellite deck), Prof. **J. Modelski** (tutor), (5).
- [MSc37] Krzysztof Mierzejewski: „*Zastosowanie biblioteki graficznej OpenGL w systemie*”

- Windows do prezentacji danych przestrzennych tomografii komputerowej* (The application of graphic library OpenGL in Windows system for computer tomography volume data presentation) Assist. Prof. **W. Smolik** (tutor), (4.5).
- [MSc38] Arkadiusz Nagórski: „*Opracowanie systemu sygnalizacji dźwiękowej w rzeczywistym wnętrzu przemysłowym*” (Development of danger signal generation system in real industrial hall), Assist. Prof. **E. Kotar-bińska** (tutor), (5).
- [MSc39] Grzegorz Nieścier: „*Programowalny multiplexer analogowy z interfejsem RS 232/485 i zestawem sond do pomiaru pola głównego w tomografie Bruhner BNT-1000*” (Programmable analog multiplexer with RS 232/485 interface and set of probes to measurement of main magnetic field in Bruhner BNT-1000 tomograph), Prof. **A. Piątkowski** / Assist. **J. Wasielewski** (tutors), (5).
- [MSc40] Marek Onyszczyk / Wojciech Koszela: „*Stanowisko do badania magistrali CAN*” (The Controller Area Network test bench), Assist. Prof. **T. Buczkowski**, (tutor), (4).
- [MSc41] Mateusz Orzechowski: „*Optymalizacja sekwencji pobudzającej w badaniach techniką MR pod kątem maksymalizacji kontrastu*” (Contrast optimisation in MR imaging experiment), Assist. Prof. **P. Bogorodzki** (tutor), (5).
- [MSc42] Robert Piotrak: „*Algorytmy rekonstrukcji i prezentacji dla trójwymiarowej ultrasonografii*” (Reconstruction and presentation algorithms for three-dimensional ultra-sound), Assist. Prof. **M. Kazubek** (tutor), (5).
- [MSc43] Piotr Płecha: „*Perspektywy rozwoju systemów telefonii komórkowej w aspekcie usług transmisji danych*” (Principal directions and perspectives of evolution of mobile networks in aspects of data services), Assist. Prof. **J. Jarkowski** (tutor), (5).
- [MSc44] Grzegorz Radzikowski: „*Optymalizacja sieci radiokomunikacyjnych przy wykorzystaniu algorytmów heurystycznych i genetycznych*” (Optimisation of radio networks with the use of heuristic and genetic algorithms), Prof. **J. Wojciechowski** (tutor), (4.5).
- [MSc45] Paweł Rowicki: „*Wyznaczanie rozkładu przestrzennego obszarów pól E-M o wartościach mogących zakłócić pracę sprzętu elektronicznego*” (Spatial distribution calculation of E-M fields capable to disturb function of electronic equipment), Assist. Prof. **J. Jarkowski** (tutor), (5).
- [MSc46] Janusz Rudnicki: „*Wielowątkowe algorytmy FDTD do przyspieszania analizy układów mikrofalowych*” (Multiplot FDTD algorithms for acceleration of analysis of microwave circuits), Prof. **W. Gwarek** (tutor), (5).
- [MSc47] Marcin Rusewicz: „*Szerokopasmowy wzmacniacz mocy na pasmo L*” (Broadband power amplifier at L band), Assist. Prof. **W. Wojtasiak** (tutor), (5).
- [MSc48] Grzegorz Sadowski: „*Detektor dopplerowski*” (Doppler detector), Assist. Prof. **W. Wojtasiak** (tutor), (4.5).
- [MSc49] Mariusz Siek: „*Badanie własności akustycznych prototypu nauszniaka przeciwhałasowego z regulowanym tłumieniem*” (Acoustic tests for level-dependent ear-muff prototypes), Assist. Prof. **E. Kotarbińska** (tutor), (5).
- [MSc50] Ewa Snitkowska: „*Kompresja obrazów z obszarami zainteresowania*” (Compression of images with regions of interest), Prof. **W. Skarbek** (tutor), (4.5).
- [MSc51] Artur Szczucki: „*Cyfrowy filtr grzebieniowy*” (Digital comb filter), Prof. **J. Modelski** (tutor), (5).
- [MSc52] Tomasz Szymański: „*System odczytu i analizy danych z aparatu EKG do badań holterowskich*” (System of reading and analysis of the data from ECG Holter recorder), Assist. Prof. **K. Zaremba** (tutor), (5).
- [MSc53] Andrzej Trawiński: „*Wykorzystanie techniki ActiveX do projektowania rozproszonych systemów pomiarowo-kontrolnych*” (ActiveX technology in designing distributed measurement systems), Assist. Prof. **W. Winiecki** (tutor), (5).
- [MSc54] Adam Trukawka: „*Symulacja cyfrowej transmisji sygnałów z modulacjami PSK w środowisku Signal Processing Work System*” (Simulation of digital modulation PSK systems in Signal Processing Work System), Assist. Prof. **K. Radecki** (tutor), (5).
- [MSc55] Adam Turowski: „*Sześciorotowy reflektometr mikrofalowy do pomiarów impulsowych ze zmiennym współczynnikiem wypełnienia*” (A six-port reflectometer for pulse measurement with variable pulse-duty factor), Assist. Prof. **W. Wojtasiak** (tutor), (5).
- [MSc56] Marek Uliczny / Sławomir Boruta: „*Metody wyznaczania zasięgów stacji bazowych systemów RRL - weryfikacja pomiarowa predykcji uzyskanej w oparciu o wybrane modele propagacji*” (Methods of determination the range of base RRL systems - measurement verification obtained by means of selected propagation

- models), Assist. Prof. **J. Jarkowski** (tutor), (5).
- [MSc57] Robert Urbański: „*Szerokopasmowe źródło sygnału szumowego na pasmo 1.2 - 2 GHz*” (Broad-band noise source for 1.2 - 2 GHz band), Assist. Prof. **W. Wojtasiak** (tutor), (5).
- [MSc58] Zbigniew Wasiuk: „*Przegląd radiowych systemów dostępowych, analiza procesu projektowania oraz optymalizacja strategii obliczeń SRDA na przykładzie sieci AirLoop*” (Revision of the radiolocal loop systems, planning process and the calculation optimisation strategy of the WLL based on airloop system), Assist. Prof. **T. Kosiło**, (tutor), (4).
- [MSc59] Leszek Wawrzos: „*Zastosowanie techniki DDS w modulacjach cyfrowych*” (Applications of the DDS technique in digital modulations), Assist. Prof. **T. Kosiło** (tutor), (5).
- [MSc60] Janusz Wiewióra: „*Anteny radiowych systemów telemetrycznych*” (Antennae for radio telemetry systems), Assist. Prof. **T. Buczkowski** (tutor), (5).
- [MSc61] Krzysztof Wiśniewski: „*Moduł DSP56002EVM - zastosowania w dydaktyce i badaniach naukowych*” (DSP56002EVM module - application in didactics and scientific reasearches), Assist. Prof. **A. Podgórski** (tutor), (5).
- [MSc62] Zbigniew Wyszomirski: „*Pomiar czasu pogłosu w oparciu o metodę Schrödera*” (Calculation the reverberation time based on Schröder method), Assist. Prof. **A. Podgórski** (tutor), (4).
- [MSc63] Tomasz Zaręba: „*Badanie właściwości akustycznych dźwięku przetworzonego przez cyfrowe urządzenia pogłosowe*” (Acoustical properties of sound processed by digital reverberators), Assist. Prof. **A. Leszczyński** (tutor), (5).
- [MSc64] Maciej Żach: „*Transmisja danych przy użyciu mechanizmu usługi SMS systemu cyfrowej telefonii komórkowej GSM*” (Data transmission using a short message service mechanism in digital cellular telecommunications system GSM), Assist. Prof. **T. Buczkowski** (tutor), (4.5).
- [MSc65] Robert Żmuda: „*Oprogramowanie systemu do akwizycji i przetwarzania danych z chromatografu gazowego SHIMADZU GC-14B*” (A computer programme for the system of data collection and analysis from the gas chromatograph SHIMADZU GC-14B), Assist. Prof. **J. Mirkowski** (tutor), (5).
- #### 6.4. B.Sc. Degrees
- [BSc1] Jarosław Amerek: „*Zasady projektowania obudów głośnikowych. Projekt obudowy do zespołu głośnikowego klasy hi-fi*” (Loudspeaker enclosure design and construction principles. An example of closed box design for hi-fi loudspeaker), Assist. Prof. **J. Narkiewicz-Jodko** (tutor), (5).
- [BSc2] Stanisław Badura: „*System nadzoru wideo z komunikacją głosową na bazie JAVA MEDIA FRAMEWORK*” (Video surveillance system with transmitted speech based on Java Media Framework), Assist. Prof. **A. Krupiczka** (tutor), (5).
- [BSc3] Bogumiła Bartecka: „*Projekt aplikacji do wizualizacji przebiegów napięciowych z wykorzystaniem karty pomiarowej Lab-PC-1200 firmy National Instruments i środowiska LabWindows/CVI*” (Project of application for development of virtual oscilloscope using National Instruments Board Lab-PC1200 and LabWindows/CVI Environment), Assist. Prof. **W. Winiecki** (tutor), (5).
- [BSc4] Piotr Bilski: „*Budowa wirtualnego analizatora widma przy użyciu zintegrowanego środowiska programowego*” (Project of virtual spectrum analyser by means of integrated software environment), Assist. Prof. **W. Winiecki** (tutor), (5).
- [BSc5] Przemysław Bocian: „*Bezodbiciowa sonda pomiarowa na pasmo L*” (Non - reflection measurement antenna for L frequency band), Prof. **S. Rosłonec** (tutor), (4).
- [BSc6] Rafał Brona: „*Prototyp systemu kontroli dostępu*” (Prototype of access control system), Assist. Prof. **W. Winiecki** (tutor), (4.5).
- [BSc7] Hubert Dąbek: „*Wpływ umiejscowienia samochodowej anteny GSM na wybrane parametry anten*” (The effect of positioning of an automobile receiver antenna on certain antennae parametres), Assist. Prof. **J. Jarkowski** (tutor), (4).
- [BSc8] Tomasz Drozd: „*Systemy monitoringu w oparciu o sieci cyfrowe*” (Monitoring systems based on digital network), Prof. **W. Skarbek** (tutor), (4.5).
- [BSc9] Krzysztof G. Dudala: „*Telewizja interaktywna, koncepcja, architektura, istniejące systemy, sprzęg z Internetem*” (Interactive television, conception, architecture, existed systems, connection with Internet), Prof. **W. Skarbek** (tutor), (4.5).
- [BSc10] Maciej Filipowicz: „*System domowej opieki medycznej - termometr*” (Medical care

- system at home - thermometer), Assist. **T. Jamrógiewicz** (tutor), (5).
- [BSc11] Andrzej Giedzic: „Oprogramowanie gabinetu lekarskiego LEGAZ” (Software of the LEGAZ - physician’s room), Prof. **A. Piątkowski** (tutor), (4,5).
- [BSc12] Arkadiusz Glinka: „Badanie urządzeń głośnikowych w warunkach pola swobodnego i w pomieszczeniach odsłuchowych” (Analysis of the method of loudspeakers measurement in a free field and in an ordinary room), Assist. Prof. **A. Leszczyński** (tutor), (5).
- [BSc13] Artur Gombosz: „Cyfrowe łącze ultrakrótkofalowe - nadajnik binarnego systemu FSK” (Digital UHF connection-binary FSK transmitter), Senior Lecturer **H. Chaciński** (tutor), (4,5).
- [BSc14] Wojciech Górka: „Projektowanie toru radiowego horyzontowej linii radiowej” (Designing of the horizontal radio link), Assist. Prof. **T. Buczkowski** (tutor), (5).
- [BSc15] Mariusz Jaroszek: „Wzmacniacz niskoszumowy” (The low noise amplifier), Prof. **J. Ebert** (tutor), (5).
- [BSc16] Paweł Jerzak: „Opracowanie stanowiska do pomiarów aparatów dla słabo słyszących z wykorzystaniem symulatora ucha” (The project of available hearing aids by means of human ears simulator), Assist. Prof. **M. Tajchert** (tutor), (5).
- [BSc17] Grzegorz Kacprzyk: „Układ kształtowania sygnału base-band w telewizji satelitarnej” (System for designing of base-band signal on satellite television), Assist. **T. Smakuszewski** (tutor), (5).
- [BSc18] Sebastian Kobierecki: „Rezonansowy wzmacniacz mocy wielkiej częstotliwości klasy D_U do laboratorium studenckiego” (High-frequency class D_U tuned power amplifier designed for students’ laboratory), Assist. Prof. **J. Modzelewski** (tutor), (5).
- [BSc19] Mariusz Kowalczyk: „Oprogramowanie do wielowymiarowej klasyfikacji wyników badań medycznych” (Software for multidimensional classification of results related to medical tests), Assist. Prof. **B. Konarzewski** (tutor), (4,5).
- [BSc20] Emil Kozłowski: „Pomiary poziomu mocy akustycznej źródeł hałasu” (Measurements of sound power level of noise sources), Assist. Prof. **E. Kotarbińska** (tutor), (5).
- [BSc21] Krzysztof Krupa: „Projekt urządzenia pomiarowego w środowisku HP-VEE z wykorzystaniem języka HP ID Language” (Design of program driver for measurement equipment in integrated environment HP-VEE using HP ID language), Assist. **R. Łukaszewski** (tutor), (5).
- [BSc22] Albert Kuran: „Projekt systemu pomiarowego wykorzystującego Dynamiczną Wymianę Danych (DDE) do komunikacji pomiędzy aplikacjami stworzonymi przy pomocy środowisk LabVIEW i HPVEE” (Project of measuring system using Dynamic Data Exchange (DDE) to communication among applications created at LabVIEW and HPVEE environments), Assist. **R. Łukaszewski** (tutor), (4,5).
- [BSc23] Włodzimierz Lora: „Przetwornik a/c dla kardiomonitora przeznaczonego do bromkowanego scyntygraficznego badania serca” (A/D converter for the cardiomonitor assigned to the gating scintigraphing examination of a heart), Assist. **T. Olszewski** (tutor), (4,5).
- [BSc24] Krzysztof Maksymiuk / Marek Skaliński: „Interaktywne przesyłanie danych medycznych w sieci komputerowej” (Interactive transmission of medical data in the computer networks), Assist. Prof. **A. Przelaskowski** (tutor), (5).
- [BSc25] Paweł Markowski: „Rezonansowy wzmacniacz mocy wielkiej częstotliwości do laboratorium studenckiego” (High-frequency Class D_U ZUS tuned power amplifier for students’ laboratory), Assist. Prof. **J. Modzelewski** (tutor), (5).
- [BSc26] Tomasz Mielcarz: „Wykorzystanie języka Java do projektowania sieciowych systemów pomiarowych” (Using Java for designing networked measurement systems), Assist. **R. Łukaszewski** (tutor), (4,5).
- [BSc27] Maciej Mikułowski: „Tomografia procesowa” (Process tomography), Assist. Prof. **R. Szabatin** (tutor), (4).
- [BSc28] Sven Nilsson: „Symulacja komputerowa procesów termicznych układu stabilizacji temperatury termostatowych generatorów kwarcowych” (Computer simulation of thermal process of temperature stabilizing network in quartz oscillators), Prof. **J. Ebert** (tutor), (4).
- [BSc29] Krzysztof Paż: „Internetowy interfejs do medycznej bazy danych w języku Java” (Internet interface to medical database in Java™ language), Assist. Prof. **W. Smolik** (tutor), (5).
- [BSc30] Paweł Plech: „Badanie wpływu systemów telefonii komórkowej na aparaturę medyczną” (Research on the influence of cellular systems on medical equipment), Assist. Prof. **T. Buczkowski** (tutor), (4,5).
- [BSc31] Paweł Popow: „Oprogramowanie sprzędaży poprzez Internet” (Software for

- Internet store), Prof. **J. Wojciechowski** (tutor), (4.5).
- [BSc32] Paweł Poznański: „Program do konwersji formatu danych ze standardem InterFile do systemu NMS” (Programme for conversion of data format from InterFile Standard to NMS system), Assist. Prof. **P. Brzeski** (tutor), (4).
- [BSc33] Paweł Radomyski: „Opracowanie i praktyczna weryfikacja metod pomiaru wzmacniaczy audio klasy hi-fi” (The project and a practical verification of hi-fi amplifier measurement procedures), Prof. **Z. Kulka** (tutor), (4).
- [BSc34] Radosław Rdzanek: „Modulator GMSK” (GMSK modulator), Assist. Prof. **K. Ra-decki** (tutor), (4).
- [BSc35] Jarosław Siembida: „Oprogramowanie minispektrometru Spectra Match GT” (Software for Spectra Match GT mini-spectrometer), Assist. Prof. **A. Miękina** (tutor), (5).
- [BSc36] Jakub Sikorski: „Opracowanie i praktyczna weryfikacja metod pomiarowych odtwarzaczy CD i DVD” (Preparation and practical verification of measuring methods for CD and DVD players), Prof. **Z. Kulka** (tutor), (4.5).
- [BSc37] Krzysztof Skowroński: „Uniwersalny, niskoszumowy wzmacniacz sygnałów biologicznych” (The universal amplifier for bioelectric signals), Assist. Prof. **J. Marzec** (tutor), (5).
- [BSc38] Konrad Sobczak: „Odbiornik w cyfrowym łączu ultrakrótkofalowym z modulacją FSK” (The receiver of digital ultrahigh-frequency link with FSK modulation), Senior Lecturer. **H. Chaciński** (tutor), (4.5).
- [BSc39] Jarosław Sobierski: „Multimedialna metabaza danych indeksowana zawartością” (Multimedia meta-database with contents based retrieval), Prof. **W. Skarbek** (tutor), (5).
- [BSc40] Marcin Socha: „Wzmacniacz klasy E” (A resonant high-frequency class E amplifier), Assist. Prof. **M. Mikołajewski** (tutor), (5).
- [BSc41] Bogusław Staniszewski: „System obsługi standardu PNG” (Utilities for handling PNG system), Prof. **W. Skarbek** (tutor), (5).
- [BSc42] Łukasz Starkiewicz-Zawiślak: „Wpływ diod PIN na działanie cyfrowych transmisyjnych modulatorów fazy” (Influence of PIN diode on the digital driving phase modulators), Assist. Prof. **J. Zborowska** (tutor), (4,5).
- [BSc43] Krzysztof Sujewicz-Sujkowski: „Opis modeli 3D w formacie SAT” (Description of 3D models in SAT format), Assist. Prof. **A. Więckowski** (tutor), (4.5).
- [BSc44] Andrzej Szerszeń: „Projekt i wykonanie odbiorczego przetwornika pojemnościowego do badań głowic detekcyjnych, emisji akustycznej w paśmie do 1 MHz” (Design of receiving capacity transducer for studies of acoustic emission working up to 1MHz), Assist. Prof. **J. Narkiewicz-Jodko** (tutor), (4).
- [BSc45] Roman Tobjasz: „Niskoszumny cyfrowy detektor fazy” (Low noise phase detector), Prof. **J. Ebert** (tutor), (5).
- [BSc46] Paweł Truchel: „Krótkie łącze radiowe do zdalnego odczytu liczników energii elektrycznej” (Short radio link for electricmeter reading system), Assist. Prof. **K. Czerwiński** (tutor), (4).
- [BSc47] Sławomir Tyszka: „Telewizja interaktywna - koncepcje, istniejące systemy, sprzęż z Internetem” (Interactive television - conceptions, existing systems, connection with the Internet), Prof. **W. Skarbek** (tutor), (4,5).
- [BSc48] Sławomir Węsek: „System akwizycji danych z gammadamery współpracujący z komputerami klasy IBM PC” (Gamma-camera data aquisition system for IBM-PC computers), Assist. **T. Olszewski** (tutor), (5).
- [BSc49] Mariusz Witkowski: „Projekt radiokomunikacyjnego systemu pomiarowo-kontrolnego z wykorzystaniem zintegrowanego graficznego środowiska programowego LabView” (Radiocommunication measurement system using integrated environment LabView), Assist. Prof. **W. Winiecki** (tutor), (5).
- [BSc50] Piotr Woźniak: „Realizacja cyfrowej transmisji danych w oparciu o procesor sygnałowy” (Digital packet transmission implementation signal processor supported), Assist. Prof. **T. Kosilo** (tutor), (5).
- [BSc51] Robert Wrębiak: „Projekt rozproszonego systemu pomiarowo-kontrolnego z wykorzystaniem Lab Windows/CVI i HP VEE” (The project of the dispersed measuring-control system utilizing LabWindows/CVI and HP VEE environments), Assist. **R. Łukaszewski** (tutor), (4,5).
- [BSc52] Piotr Żołopa: „Program do transmisji obrazowych danych medycznych według protokołu DICOM z wykorzystaniem biblioteki funkcji obsługi gniazd "WINSOCK API" - serwer serwisu DICOM” (Application for transfer medical image data in DICOM standard protocol using „WINSOCK API” interface - DICOM service provider), Assist. Prof. **W. Smolik**, (tutor), (5).

6.4.a. B.Sc. Degrees - Courses for Part-Time Studies on Radiocommunications

- [BSc53] Andrzej Adamczyk: „Projekt umieszczenia polskiego satelity telekomunikacyjnego na orbicie geostacjonarnej” (The project of placing Polish telecommunication satellite on a geostationary orbit), Assist. Prof. **K. Derzakowski**, (tutor), (3.5).
- [BSc54] Lech Baj: „Modulator FSK do laboratorium radiokomunikacji” (FSK modulator for radiocommunication laboratory), Assist. Prof. **K. Radecki**, (tutor), (5).
- [BSc55] Krzysztof Banulski / Mariusz Popławski: „Projekt i wykonanie modulatora 16-QAM do celów dydaktycznych” (Design and mounting of 16 QAM modulator for didactic destination), Senior Lecturer **H. Chaciński** (tutor), (4.5).
- [BSc56] Andrzej Bieniek: „Projekt sieci teletransmisyjnej SDH dla potrzeb obsługi ruchu w ramach wybranej strefy numeracyjnej” (Introductory project of SDH transmission network for the particular numbering area traffic), Assist. Prof. **S. Kula** (tutor), (5).
- [BSc57] Joachim Dymarczyk / Lech Baj: „Demodulator FSK do laboratorium radiokomunikacji” (FSK demodulator for radiocommunication laboratory), Assist. Prof. **K. Radecki** (tutor), (4.5).
- [BSc58] Adam S. Czerwiński: „Analiza porównawcza metod dostępu warunkowego dla średniej wielkości szerokopasmowych sieci CATV” (Analysis of comparative methods of conditional access for average size broad band multimedia networks CATV), Senior Lecturer **T. Krzymień** (tutor), (4.5).
- [BSc59] Krzysztof Dembowski / Mariusz Krzysztofek: „Projekt linii opto-telekomunikacyjnej wewnątrz-strefowej” (The project of long-distance fiber-optical network), Prof. **K. Holejko** (tutor), (5).
- [BSc60] Joachim Dymarczyk: „Demodulator FSK do laboratorium radiokomunikacji” (FSK demodulator for radiocommunication laboratory), Assist. Prof. **K. Radecki**, (tutor), (3.5).
- [BSc61] Maciej Gąsiorek / Stanisław Serzysko: „Telefonizacja gmin z wykorzystaniem światłowodowych systemów dostępowych” (The project of net, FITL type, for communes by means of fiber-optical access network systems), Prof. **K. Holejko** (tutor), (5).
- [BSc62] Krzysztof Jabłoński: „Wtórny wzorzec częstotliwości” (The secondary frequency standard), Assist. Prof. **T. Buczkowski**, (tutor), (4).
- [BSc63] Robert Jakubas: „Modulator i demodulator kwadraturowy dla laboratorium telekomunikacji” (Quadrature I/Q modulator for radiocommunication laboratory), Assist. Prof. **K. Radecki**, (tutor), (4.5).
- [BSc64] Waldemar Jasek: „Opracowanie metody pomiaru mocy wyjściowej nadajnika telewizyjnego” (A new method of power measurements of television transmitters), Assist. Prof. **J. Modzelewski** (tutor), (4).
- [BSc65] Elżbieta Karpińska / Ewa Pecura: „Praktyczne aspekty zarządzania elementami sieci SDH - analiza pracy i ocena działania systemu EM-OS” (Practical aspects of SDH network element management - analysis of EM-OS system), Assist. Prof. **S. Kula** (tutor), (5).
- [BSc66] Roman Kluska: „Uniwersalny przełącznik dwugałęźny do domowej instalacji TV satelitarnej” (Universal switch dual to household installation TV satellite), Senior Lecturer **T. Krzymień** (tutor), (4.5).
- [BSc67] Paweł Laskowski: „Projekt, wykonanie i uruchomienie systemu komputerowego monitoringu nadajników w telewizyjnym ośrodku nadawczym w Warszawie” (A design, construction and starting of computer system for monitoring of transmitters on television broadcast center in Warsaw), Assist. Prof. **M. Mikołajewski** (tutor), (5).
- [BSc68] Dariusz Miliszewski / Marek Targoński: „Pomiary fluktuacji fazy sygnałów i urządzeń SDH oraz generatora zegara SDH” (Measurements of SDH phase fluctuation and SDH clock generator), Assist. Prof. **S. Kula** (tutor), (4).
- [BSc69] Paweł Pastuszka: „Mikrofalowy wzmacniacz średniej mocy na pasmo L” (L-band power amplifier), Assist. Prof. **W. Wojtasiak** (tutor), (4).
- [BSc70] Krzysztof Podgórski: „Mikroprocesorowy układ ciągłej kontroli wybranych parametrów bezobsługowej sieci retransmisyjnej TV” (A microprocessor system for continuous monitoring of selected parameters of an automatic TV relay station), Assist. Prof. **K. Czerwiński** (tutor), (5).
- [BSc71] Paweł Prokop: „Rozległa sieć transmisji danych dla potrzeb systemu telemedycznego” (Wide area of data transmission for tele-medical system), Assist. **T. Olszewski** (tutor), (5).
- [BSc72] Andrzej Przekaz: „Filtr dolnoprzepustowy do syntezy na pasmo 0.9÷1,6 GHz” (Lowpass filter for 0.9÷1.6GHz band synthesizer), Assist. Prof. **W. Wojtasiak** (tutor), (4).

[BSc73] Krzysztof Rychliński: „Projekt serwera internetowego dla potrzeb telemedycyny” (Internet server project for tele-medical needs), Assist. **T. Olszewski** (tutor), (3.5).

[BSc74] Paweł Socha: „Generator sygnałów I/R dla modulacji PSK” (I/R signal generator for PSK modulation), Assist. Prof. **K. Radecki** (tutor), (4.5).

[BSc75] Ireneusz Trokielewicz: „Procedura pomiaru systemów antenowych metodą odległościową” (Procedure of measurement antenna systems by means of distance method), Assist Prof. **J. Jarkowski** (tutor), (5).

[BSc76] Jacek Wojtczak: „Układ kontroli emisji programów radiowych” (The control circuit of broadcast radio programmes), Assist. Prof. **M. Mikołajewski** (tutor), (4.5).

7. PUBLICATIONS

7.1. Scientific and technical books, chapters in books

- [Pub1] P. Bogorodzki: „Komputery w radiologii” (Computers in Radiology), In: *„Diagnostyka obrazowa. Podstawy metodyczne i technika badania”*, (Medical Imaging), (Ed. B. Pruszyński), PZWL, Warsaw (2000), pp. 556-565.
- [Pub2] S. L. Hahn: "Hilbert Transforms", In: *„The Transforms and Applications Handbook”* (Ed: A. Poularikas), CRC Press, Inc., Boca Raton, Florida, USA, and IEEE Press, (2000), second edition, *Chapter 7*, pp. 7-1 - 7-174, (ISBN 0-8493-8595-4).
- [Pub3] W. Skarbek: "Image Compression Using Pixel Neural Networks", In: *„Soft Computing for Image Processing”*, (Eds.: S. K. Pal, A. Ghosh, M. K. Kundu), *Physica - Verlag*, (2000), pp. 162-182 (ISBN 3-7908-1268-4).

7.2. Scientific and technical papers in journals

- [Pub4] D. Adams, K. Zaremba et al.: "Measurement of the SMC Moun Beam Polarization Using the Asymmetry in the Elastic Scattering of Polarized Electrons", *Nucl. Instrum. Meth A443*, (2000), pp. 1-19.
- [Pub5] P. Bobiński, W. Winiecki: „Metodyka projektowania programowych sterowników przyrządów pomiarowych dla zintegrowanych środowisk programowych LabVIEW i LabWindows/CVI” (Methodology of Designing Programmable Drivers for Measuring Devices in Integrated LabVIEW and LabWindows/CVI Environments), *Pomiary, Automatyka, Kontrola PAK* (Measurements, Automation, Control) No. 1, (2000), pp. 3-6.
- [Pub6] P. Bogorodzki, W. Smolik: „Teleradiologia”, (Teleradiology), *Telekomunikacja i telematyka*, No. 4, (2000), pp. 31-33.
- [Pub7] P. Brzeski, J. Mirkowski, T. Olszewski, W. Smolik, R. Szabatin: "System do wizualizacji i analizy badań tomografii emisyjnej dla diagnostyki mięśnia sercowego i badań funkcjonalnych mózgu” (Research Workstation for Visualisation and Analysis of Brain and Miocardium Functional SPECT Tomographic Studies), *Bioinżynieria - Program Naukowo-Badawczy*, Academic Publishing House - Warsaw University of Technology, (2000), pp. 67-71.

- [Pub8] G. Domański, Z. Pawłowski, J. Marzec, K. Zaremba, B. Konarzewski: „Optymalizacja aparatury do skaningowego badania gęstości kości” (Optimization of the Bone Density Scanning System with Scintillating Head), *Bioinżynieria - Program Naukowo-Badawczy*, Academic Publishing House - Warsaw University of Technology, (2000), pp. 73-82.
- [Pub9] S. L. Hahn: "The Instantaneous Complex Frequency of the Sum of Two Harmonic Signals", *Bulletin of the Polish Academy of Sciences, Technical Science*, Vol. 48, No. 4, (2000).
- [Pub10] T. Jamrógiewicz: „K-SEP-I-001.SCSI3-Protokół magistrali szeregowej” (K.SEP-I-001.SCSI3 - Serial Bus Protocol), *Centralny Ośrodek Szkolenia i Wydawnictw*, Warsaw (2000), pp. 1-24.
- [Pub11] J. Jarkowski, S. Hahn: "Turbokody - granica marzeń" (TurboCodes - the Limits of Dreams), *Przegląd Telekomunikacyjny* (Telecommunication Review), No. 4, (2000), pp. 288-293.
- [Pub12] M. Kazubek: „Przystawka do aparatu USG umożliwiająca trójwymiarowe badanie piersi” (An Accessory for Ultrasound Imaging System for Three-Dimensional Breast Examination), *Bioinżynieria - Priorytetowy Program Naukowo-Badawczy*, No. 2, Academic Publishing House - Warsaw University of Technology, (2000), pp. 25-36.
- [Pub13] E. Kotarbińska, J. Mnich: "Ochronniki słuchu", (Hearing Protectors), *Bezpieczeństwo Pracy*, No. 1, (2000), pp. 30-31.
- [Pub14] E. Kotarbińska: „Ochronniki słuchu jako element profilaktyki zawodowego uszkodzenia słuchu” (Hearing Protectors as an Element of Prevention of Occupational Hearing Damage), *Medycyna Pracy*, No. 2, (2000), pp. 185-198.
- [Pub15] Z. Kulka, M. Kapusta: "Multilayer Fluorescence Discs", Part I: *SAT-AV*, No. 7-8, (2000), pp. 76-78, Part II: *SAT-AV*, No. 9, (2000), pp. 65-68.
- [Pub16] Z. Kulka: "CD-R Discs in Audio Applications", *SAT-AV*, No. 12, (2000), pp. 64-65.
- [Pub17] Z. Kulka: "DVD-Audio Ready” (DVD-Audio Series; Technics), *SAT-AV* No. 2, (2000), pp. 77-81.
- [Pub18] Z. Kulka: "Extension of Sony ES Series”, *SAT-AV* No. 1, (2000), pp. 72-74.
- [Pub19] Z. Kulka: "High Quality Sound Recording without Compression”, Part I: *SAT-AV*,

- No. 3, (2000), pp. 76-78, Part II: *SAT-AV*, No. 4, (2000), pp. 74-77.
- [Pub20] Z. Kulka: "High-End Exhibition in Gravenbruch", Part I: *SAT-AV*, No. 9, (2000), pp. 14-17, Part II: *SAT-AV*, No. 10, (2000), pp. 12-18, Part III: *SAT-AV*, (2000), pp. 14-16.
- [Pub21] Z. Kulka: "The Charming Sound of Tubes", Part I: *SAT-AV*, No. 5, (2000), pp. 21-24, Part II: *SAT-AV*, No. 6, (2000), pp. 59-62.
- [Pub22] P. Kwiecień: "Digital Audio Amplifiers", *SAT-AV*, No. 9, (2000), pp. 68-71.
- [Pub23] P. Kwiecień: "High-End LP Players from Holland", *SAT-AV*, No. 11, (2000), pp. 74-75.
- [Pub24] P. Kwiecień: "LP Players of XXI-st Century", *SAT-AV*, No. 1, (2000), pp. 19-21.
- [Pub25] P. Kwiecień: "Transistor Audio Amplifiers", *SAT-AV*, No. 6, (2000), pp. 64-67.
- [Pub26] P. Kwiecień: "Valve Audio Amplifiers", *SAT-AV*, No. 7-8, (2000), pp. 66-69.
- [Pub27] A. Leszczyński: "Acoustic AudioBeam", *SAT-AV*, No. 6, (2000), pp. 22-23.
- [Pub28] J. Marzec, K. Zaremba, Z. Pawłowski, B. Konarzewski: "Signal Propagation in Straw Tubes with Resistive Cathode", *IEEE Transactions on Nuclear Science*, Vol. 47, No. 1, (2000), pp. 18-24.
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- [Rep13] A. Krupiczka, A. Buchowicz, T. Smakuszewski, J. Kondarewicz: *„Opracowanie i implementacja systemu sieciowej transmisji strumieni wideo na potrzeby telewizji interaktywnej z wykorzystaniem dostępnych technologii”* (Development of Network Video Streams Communication System for the Interactive Television by the Usage of Available Technologies), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No. 504G/1034/0370), Warsaw, Apr. 2000, 30 pp.
- [Rep14] T. Krzymień: *„Komputerowe stanowisko do subiektywnego i obiektywnego badania jakości obrazu telewizyjnego w systemach z kompresją”* (Computer Test Set for Subjective and Objective Assessment of the Quality of Television Picture for Compressed Systems), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No. 503G/1034/4014), Warsaw, Jun. 2000, 12 pp.
- [Rep15] Z. Kulka, A. Leszczyński, M. Tajchert, J. Narkiewicz-Jodko, P. Kwiecień, P. Nykiel, R. Smoliński, A. Aronowski: *„Badania i rozwój elektroakustycznych systemów studyjnych i pomiarowych”* (Research and Development of Electroacoustic Systems for Studio and Measurement Applications), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No. 504G/1034/0370), Warsaw, Apr. 2000, 37 pp.
- [Rep16] Z. Kulka, A. Leszczyński, P. Nykiel: *„Opracowanie i wykonanie stanowiska badawczego do projektowania specjalizowanych fonicznych filtrów cyfrowych realizowanych techniką DSP”* (Design and Construction of Research Stand for Designing of the Specialized Digital Audio Filters Based on Digital Signal Processors), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No. 503G/1034/4011), Warsaw, Jun. 2000, 33 pp.
- [Rep17] Z. Kulka: *„Wprowadzenie zmian prototypu nauszników przeciwhałasowych z regulowanym tłumieniem, wynikających z przeprowadzonych badań użytkowych i wykonanie serii próbnej zmodernizowanych nauszników”* (Introduction of Some Modifications to Level-Dependent Ear-Muffs due to Utilize Tests and Production of Short Series New Ear-Muffs Prototypes), Final report for the Central Institute for Labour Protection, (No. 501E/1034/1329), Warsaw, Nov. 2000, 20 pp.
- [Rep18] A. Leszczyński: *„Wykonanie pomiarów zniekształceń dźwięku rejestrowanego przez kamerę VHS Panasonic”* (Measurements of THD Distortion of Sound Registered by means of Panasonic VHS Camera), Final report for the Panasonic Polska Limited Company, (No. 501E/1034/1326), Warsaw, May 2000, 19 pp.
- [Rep19] J. Marzec, G. Domański, Z. Pawłowski, K. Zaremba, B. Konarzewski, A. Borecki: *„Optymalizacja aparatury do skaningowych badań gęstości tkanek kostnych”* (Optimization of the Bone Density Scanning System), Final report for the priority grant, Institute of Radioelectronics, WUT, Warsaw, May 2000, 10 pp.
- [Rep20] M. Mikołajewski: *„Optymalizacja rezonansowego wzmacniacza klasy E wielkiej częstotliwości w układach o zmiennej impedancji obciążenia”* (Optimisation of a Resonant Hi-Fi Class E Amplifier Operating with Variable Load), Final report for the Rector grant, Institute of Radioelectronics, WUT, (No. 503R-1034/3935), Warsaw, Jun. 2000, 54 pp.
- [Rep21] J. Mirkowski: *„Model tomografu pojemnościowego”* (Capacitance Tomograph Model), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No. 503G/1034/4018), Warsaw, Jun. 2000, 20 pp.
- [Rep22] J. Modelski: *„Satelitarne systemy radiokomunikacyjne i multimedialne”* (Radiocommunication and Multimedia Sattelite Systems), Final report for the Rector grant, Institute of Radioelectronics, WUT, (No. 503G/1034/3937), Warsaw, Jun. 2000, 6 pp.
- [Rep23] J. Modelski, H. Chaciński, M. Celuch-Marcysiak, W. Gwarek, J. Jarkowski, E. Yashchyshyn, M. Piasecki, S. Rosłonec: *„Nowe rodzaje anten, metody ich projektowania i pomiarów”* (New Types of Antennae and Methods of Their Design and Measurement), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No. 503G/1034/4020), Warsaw, Jun. 2000, 43 pp.
- [Rep24] J. Modelski, K. Mroczek: *„Modyfikacja systemu do wstępnego przetwarzania obrazów w systemach wizyjnych czasu rzeczywistego”* (Modification of Video Preprocessing System for Real Time Applications), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No. 504G/1034/0370), Warsaw, Apr. 2000, 17 pp.
- [Rep25] R. Z. Morawski: *„Realizacja i badanie wybranych algorytmów interpretacji danych pomiarowych”* (Implementation and Investigation of the Selected Algorithms for Interpretation of Measurement Data), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No. 504G/1034/0370), Warsaw, Apr. 2000, 52 pp.

- [Rep26] T. Morawski, W. Gwarek, K. Kowalski: „Projektowanie, modelowanie i pomiary wybranych układów mikrofalowych„ (Design, Modelling and Measurements of Selected Microwave Circuits), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No. 504G/1034/0370), Warsaw, Apr. 2000, 35 pp.
- [Rep27] T. Morawski, W. Wojtasiak, J. Zborowska, D. Gryglewski, R. Michnowski, M. Kukier: „Projektowanie mikrofalowych wzmacniaczy dużych mocy z uwzględnieniem zależności elementów schematu modelu tranzystora MESFET od amplitudy sygnału sterującego” (Microwave High Power Amplifiers Design Using the Dependence of Elements of MESFET Transistor Equivalent Circuit on Power Level), Final report for the Rector grant, Institute of Radioelectronics, WUT, (No. 503R/1034/3936), Warsaw, Jun. 2000, 15 pp.
- [Rep28] T. Morawski: „Projektowanie szeropasmowych mikrofalowych wzmacniaczy dużych mocy” (Design of Broad-Band High-Power Microwave Amplifiers), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No. 503G/1034/4016), Warsaw, Jun. 2000, 16 pp.
- [Rep29] Z. Pawłowski, A. Piątkowski, M. Kazubek, R. Szabatin: „Metody radiacyjne w technikach medycznych” (Radiation Methods in Medical Techniques), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No. 504G/1034/0370), Warsaw, Apr. 2000, 30 pp.
- [Rep30] A. Piątkowski: „Analiza załamka T metodami elektrokardiografii wysokiej rozdzielczości” (T-Wave Analysis Using High-Resolution ECG), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No. 503G/1034/4015), Warsaw, Jun. 2000, 25 pp.
- [Rep31] A. Piątkowski: „Symulator ekspozycji w tomografii Rezonansu Magnetycznego”. (MRI Tomography Simulator), Final report for the priority grant, Institute of Radioelectronics, WUT, Warsaw, May 2000, 12 pp.
- [Rep32] A. Przelaskowski: „Algorytmy wyznaczania optymalnej reprezentacji danych w zastosowaniu do archiwizacji i transmisji medycznych danych obrazowych” (Algorithms of Optimised Data Representation Assignment Applied to Archiving and Transmission of Medical Image Data), Final report for the Rector grant, Institute of Radioelectronics, WUT, (No. 503R/1034/3932), Warsaw, Jun. 2000, 215 pp.
- [Rep33] W. Skarbek: „Wirtualne laboratorium w Internecie” (Virtual Laboratory Accessible via Internet), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No. 503G/1034/4010), Warsaw, Jun. 2000, 260 pp.
- [Rep34] W. Skarbek, A. Pietrowcew, P. Sokółowski: „Neuronowe algorytmy kompresji informacji multimedialnej” (Neural Algorithms for Compression of Multimedia Information), Final report for the Rector grant, Institute of Radioelectronics, WUT, (No. 503R/1034/3931), Warsaw, Jun. 2000, 7 pp.
- [Rep35] W. Skarbek: „Prototyp zintegrowanego systemu cyfrowego monitoringu telewizyjnego z użyciem kodowania falkowego i jego pochodnych dla systemu Linux i MSWindows IV T” (The Prototype of Integrated Digital Television Monitoring System Using a Wavelet Coding and its Derivatives for Linux and MSWindows IVT System), Final report for the POLIXEL S.A, (No. 501E/1034/1319), Warsaw, Jan. 2000, 20 pp.
- [Rep36] W. Smolik: „Teleradiologiczny system wspomagania diagnostyki raka piersi w oparciu o system DICOM” (Teleradiological System for Computer-Aided Diagnostics of Breast Cancer on the Basis of the DICOM Standard), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No. 503G/1034/4012), Warsaw, Jun. 2000, 29 pp.
- [Rep37] R. Szabatin: „System do wizualizacji i badań tomografii emisyjnej dla diagnostyki mięśnia sercowego i badań funkcjonalnych mózgu”. (Research Workstation for Visualisation and Analysis of Brain and Miocardium Functional SPECT Tomographic Studies), Final report for the priority grant, Institute of Radioelectronics, WUT, Warsaw, May 2000, 6 pp.
- [Rep38] R. Szabatin: „Wykonanie unikatowego stanowiska badawczego do PT z komputerem PC do rekonstrukcji i analizy obrazów” (Design and Construction of the Unique Research Stand for Process Tomography for Image Reconstruction and Analyses), Final report for the Institute of Organic Industry, Warsaw, Oct. 2000, 20 pp.
- [Rep39] W. Winiecki, K. Adamowicz, P. Bobiński, R. Leoniak, R. Łukaszewski: „Nowoczesne metody projektowania komputerowych systemów pomiarowych” (Novel Methods of Computer Measuring Systems Designing), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No. 504G/1034/0370), Warsaw, Apr. 2000, 56 pp.
- [Rep40] W. Winiecki, K. Adamowicz, P. Bobiński, R. Leoniak, R. Łukaszewski: „Metodyka projektowania komputerowych systemów pomiarowych z wykorzystaniem graficznych, zintegrowanych środowisk programowych” (Methodology of Measuring Systems Design Using Graphical Integrated Software Environment), Final

- report for the Rector grant, Institute of Radioelectronics, WUT, (No. 503R/1034/3934), Warsaw, Jun. 2000, 134 pp.
- [Rep41] J. Wojciechowski: „*Diagnostyka systemów liniowych z niejednoznacznyimi grupami parametrów*” (Diagnostics of Linear Systems with Ambiguity Groups of Parameters), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No. 503G/1034/4013), Warsaw, Jun. 2000, 6. pp.
- [Rep42] J. Wojciechowski, T. Buczkowski, J. Cichoński, K. Czerwiński, J. Jarkowski, W. Kazubski, T. Kosiło, A. Fiok, K. Radecki, B. Sawionek, H. Chaciński, D. Grabowski, J. Kołakowski, S. Maszczyk, S. Żmudzin: „*Transmisja cyfrowa w łączach radiowych*” (Digital Transmission in Radio Links), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No. 504G/1034/0370), Warsaw, Apr. 2000, 40 pp.
- [Rep43] W. Wojtasiak: „*Opracowanie i wykonanie podzespołów źródeł szumów na pasma L i S*” (L and S Band Noise Sources Components Construction and Elaboration), Final report for the Military Institute of Armament Technology, (No. 501E/1034/1323), Jun. 2000, 11 pp.
- [Rep44] W. Wojtasiak: „*Opracowanie wzmacniacza na pasmo S zintegrowanego ze źródłem szumów*” (S-Band Amplifier with Integrated Noise Source Elaboration), Final report for the Military Institute of Armament Technology, (No. 501E/1034/1324), Oct. 2000, 10 pp.
- [Rep45] W. Wojtasiak: „*Projekt układów odbiornika i nadajnika do modułu nadawczo-odbiorczego*” (The Transmitter and Receiver Circuits Design of C Band T/R Module), Final report for the Telecommunication Research Institute, (No. 501E/1034/1328), Nov. 2000, 9 pp.
- [Rep46] Y. Yashchyshyn, J. Modelski: „*Projekt komory bezekowej na pasmo fal milimetrycznych*” (Project of Millimeter Waves Anechoic Chamber), Internal report - Institute of Radioelectronics, WUT, (No. 1), Warsaw, Nov. 2000, 21 pp.
- [Rep47] K. Zaremba, J. Marzec, Z. Pawłowski, B. Konarzewski: „*Eksperyment COMPASS (CERN) - budowa aparatury i przygotowanie oprogramowania*” (COMPASS Experiment - Design of the Apparatus and Software Development), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No. 504G/1034/0380), Warsaw, Apr. 2000, 50 pp.
- [Rep48] K. Zaremba, J. Marzec, Z. Pawłowski, B. Konarzewski: „*Eksperyment COMPASS (CERN) - budowa aparatury i przygotowanie oprogramowania*” (COMPASS Experiment - Design of the Apparatus and Software Development), Final report for the KBN grant, Institute of Radioelectronics, WUT, Warsaw, Jun. 2000, 52. pp.

9. CONFERENCES, SEMINARS AND MEETINGS

9.1. International conferences

- [Con1] *International Conference on Modern Problems of Telecommunications, Computer Science and Engineers Training TCSET'2000* (Sławsko, Ukraine, Feb. 14-19, 2000), Z. Walczak (speaker), Y. Yashchyshyn (member of the Organizing Committee and speaker).
- [Con2] *Data Compression Conference'2000* (Snowbird, Utah, USA, Mar. 28-30, 2000), A. Przelaskowski (speaker).
- [Con3] *IEEE Instrumentation and Measurement Technology Conference - IMTC'2000* (Baltimore, USA, May 1-4, 2000), R. Z. Morawski (speaker).
- [Con4] *30-th European Microwave Conference* (Paris, France, May 5-7, 2000), J. Modelski (member of the TPC).
- [Con5] *3-rd International Telecommunications Energy Special Conference: TELESCON 2000* (Dresden, Germany, May 7-10, 2000), A. Wajs (speaker).
- [Con6] *XIII-rd International Conference on Microwaves, Radar and Wireless Communications: MIKON'2000* (Wrocław, Poland, May 22-24, 2000), J. Modelski (chairman of the TPC), W. Gwarek, (member of the TPC), T. Morawski (member of the TPC), M. Celuch-Marcysiak, K. Derzakowski, D. Gryglewski, D. Janusek, T. Keller, M. Kukier, K. Kurek, R. Michnowski, J. Rudnicki, W. Wojtasiak, Y. Yashchyshyn, J. Zborowska, (speakers).
- [Con7] *ISCAS'2000* (Geneva, Switzerland, May 27-31, 2000), B. Sawionek (speaker).
- [Con8] *Portuguese Conference on Pattern Recognition* (Porto, Portugal, May 11-12, 2000), P. Bobiński (participant).
- [Con9] *6-th International Conference on Computer Graphics and Image Processing* (6 Konferencja GPKO'2000: Grafika Komputerowa i Przetwarzanie Obrazów (Podlesice k/Częstochowy, Poland, May 18-19, 2000), A. Przelaskowski (speaker).
- [Con10] *15-th International Symposium and Exhibition on Electromagnetic Compatibility* (Wrocław, Poland, May 22-24, 2000), J. Kołakowski, (speaker), D. Grabowski, S. Maszczyk (participants).
- [Con11] *International Microwave Symposium - IMS* (Boston, USA, Jun. 11-16, 2000), M. Celuch-Marcysiak (speaker), W. Gwarek (member of TPC, speaker), J. Modelski (session chairman, member of TPC and AdCom.).
- [Con12] *7-th International Conference: Mixed Design of Integrated Circuits and Systems - MIXDES' 2000* (Gdynia, Poland, Jun. 15-17, 2000), J. Wojciechowski (speaker).
- [Con13] *2000 ASEE Annual Conference* (St.Louis, USA, Jun. 18-21, 2000), R. Z. Morawski (speaker).
- [Con14] *World Multiconference on Systemics, Cybernetics-SCI'2000 and 6-th International Conference on Informatic Systems-ISAS'2000* (Orlando, Florida, USA, Jun. 23-26, 2000), Z. Walczak (speaker).
- [Con15] *2000 IEEE AP-S International Symposium and USNC/URSI National Radio Science Meeting* (Salt Lake City, Utah, USA, Jul. 16-21, 2000), M. Celuch-Marcysiak J. Modelski, Y. Yashchyshyn (speakers).
- [Con16] *International Congress on Noise Control Engineering: INTERNOISE'2000* (Nice, France, Aug. 27-30, 2000), E. Kotarbińska, A. Podgórski (speakers).
- [Con17] *International Conference on Microwave Ferrites: CMOF'2000* (Rokosowo, Poland, Sept. 4-7, 2000), T. Morawski (speaker).
- [Con18] *International Conference: Applied Electronics 2000* (Pilsen, Czech Republic, Sept. 6-7, 2000), T. Buczkowski, J. Jarkowski, K. Snopek (speakers).
- [Con19] *International Conference; MECHATRONICS'2000* (Warsaw, Poland, Sept. 21-23, 2000), A. Podgórski (speaker).
- [Con20] *XVI-th World IMEKO Congress* (Vienna, Austria, Sept. 25-28, 2000), P. Bobiński J. Cichocki, J. Kołakowski A. Miękina, R. Z. Morawski, A. Podgórski, W. Winiecki (speakers).
- [Con21] *Kleinheubacher Tagung 2000* (Kleinheubach, Germany, Sept. 25-29, 2000), S. Hahn, J. Jarkowski, K. Snopek (speakers).
- [Con22] *30-th European Microwave Conference* (Paris, France, Oct. 2-6, 2000), J. Modelski (member of the TPC and speaker), Y. Yashchyshyn (speaker).
- [Con23] *International Conference on Signals and Electronic Systems: ICSES'2000* (Gliwice-Ustroń, Poland, Oct. 17-20, 2000), J. Wojciechowski (session chairman), A. Abramowicz, T. Ciamulski, K. Derzakowski, P. Kopyt, M. Mikołajewski, K. Snopek, A. Wajs, (speakers).

9.2. Local conferences

- [Con24] *Konferencja Naukowo-Techniczna: Systemy i Technologie Telekomunikacji Multimedialnej STM'2000* (Systems and Technologies in Multimedia Telecommunications) (Łódź, Poland, Mar. 14-15, 2000), J. Modelski (vice-chairman of the TPC), W. Skarbak (member of the TPC), P. Bobiński, G. Galiński, A. Krupiczka, T. Krzymień, K. Mroczek, A. Ritz, G. Siemek (speakers).
- [Con25] *V Krajowa Konferencja Radiodifuzji i Radiokomunikacji - KKRR'2000* (V-th National Conference on Radiodiffusion and Radiocommunications) (Poznań, Poland, Jun. 6-8, 2000), J. Modelski (member of the TPC and invited speaker) J. Cichocki, D. Grabowski, T. Keller, M. Konwicki, T. Kosiło, S. Maszczyk Z. Walczak (speakers).
- [Con26] *XI Mikrofalowa Wojskowa Konferencja - Sterowanie i Regulacja w Radiokomunikacji i Obiektach Latających* (XI-th Microwave Military Conference: Steering and Regulation in Radiocommunications and Flying Objects) (Jelenia Góra, Poland, Jun. 14-16, 2000), D. Gryglewski, M. Kukier, W. Wojtasiak (participants).
- [Con27] *III Konferencja „Systemy pomiarowe w badaniach naukowych i w przemyśle SP'2000”* (III-rd Conference on Measuring Systems in Research and Industry), (Zielona Góra, Jun. 2000), W. Winiński (member of Scientific Committee).
- [Con28] *Krajowe Sympozjum Telekomunikacji - KST'2000* (National Symposium on Telecommunications) (Bydgoszcz, Poland, Sept. 6-8, 2000), J. Modelski (member of the TPC and MC), F. A. Alwafi, P. Bogorodzki, J. Cichocki, M. Konwicki, T. Kosiło, S. Maszczyk, W. Smolik (speakers), Z. Walczak (participant).
- [Con29] *XXXII Międzynarodowa Konferencja Metrologów MKM'2000* (XXXII-nd Inter-University Metrologists' Conference) (Rzeszów - Jawor, Poland, Sept. 11-15, 2000), M. Kukier, R. Łukaszewski, R. Michnowski, A. Podgórski, W. Winiński (speakers).
- [Con30] *RCMCIS'2000 - Regional Conference on Military Communication and Information Systems 2000: Partnership for CIS Interoperability* (Zegrze, Poland, Oct. 4-6, 2000), H. Chaciński, K. Kowalski (speakers), R. Michnowski, J. Modelski (member of the TPC), K. Robaczyński (participant).
- [Con31] *VII Sympozjum „Nowości w Technice Audio” Multimedia - Technika Audio i Wideo* (VII-th Symposium; New Trends in Audio Technology: Multimedia - Audio and Video Technology) (Warsaw, Poland, Oct. 6-7, 2000), Z. Kulka, W. Skarbak (co-

chairmen of the Scientific Committee, members of the Organizing Committee), J. Modelski, W. Winiński (members of the Scientific Committee), M. Tajchert (member of the Organizing Committee), A. Buchowicz, K. Ignasiak, A. Krupiczka, P. Nykiel, G. Siemek, R. Smoliński, P. Sokołowski, R. Zawadzki (speakers), P. Bobiński, G. Galiński, A. Leszczyński, J. Narkiewicz-Jodko, A. Pietrowcew (participants).

- [Con32] *XXV Konferencja Elektroniki i Telekomunikacji* (XXV-th Conference on Electronics and Telecommunications), (Warsaw, Poland, Nov. 8-9, 2000), P. Kwiecień, M. Piasecki, M. Siek (participants).
- [Con33] *XXV Warsztaty Naukowo-Szkoleniowe Audiologii i Foniatrii: „Nowe techniki, nowe metody i narzędzia w diagnostyce i leczeniu zaburzeń słuchu, wzroku i mowy”* (XXV-th Workshop on Audiology and Phoniatry: "New technics, methods and tools in diagnostics and therapy of hearing, vision and speech impairments" (Jachranka, Poland, Dec. 8-9, 2000), A. Leszczyński (participant).

9.3. Schools, seminars and meetings

- [Con34] *Technical Programme Committee Meeting of the IEEE MTT International Microwave Conference* (Boston, USA, Jan. 8-11, 2000), W. Gwarek (member of the TPC), J. Modelski (member of the TPC AdCom.).
- [Con35] *IV Szkoła Komputerowego Wspomagania Projektowania, Wytwarzania i Eksploatacji* (IV-th School Computer-Aided Design, Production and Exploation) (Jurata, Poland, May 15-19, 2000), J. Mirkowski, R. Szabatin, (participants).
- [Con36] *III Seminarium; Miernictwo Sygnałów Przypadkowych* (III-rd Seminar; Measurement of Accidental Signals) (Gdańsk - Wieżyca, Poland, Jun. 28-30, 2000), D. Gryglewski, S. Hahn, J. Jar-kowski, W. Wojtasiak (speakers).
- [Con37] *The International Seminar; Thermic'2000* (Zakopane, Poland, Oct. 3-5, 2000), D. Gryglewski (speaker), R. Michnowski, (participant).
- [Con38] *Warsztaty-EMC'2000; EMC'2000 Workshops* (Wrocław, Poland, Oct. 10-11, 2000), T. Ciamulski, W. Kazubski, (participants).
- [Con39] *Meeting of IEEE Microwave Theory and Techniques Society* (Dallas, USA, Oct. 12-16, 2000), J. Modelski (member of the TPC).
- [Con40] *ESMU/CHEMS Seminar; Virtual Higher Education* (Barcelona, Spain, November 1-5, 2000), R. Z Morawski, (participant).
- [Con41] *Open Seminar on Acoustics - OSA'2000* (Rzeszów, Poland, Sept. 18-22, 2000), E. Kotarbińska, (speaker).

10. THE PRIZES AND DISTINCTIONS RECEIVED BY THE STAFF

10.1. International Awards

Wojciech Gwarek, Prof.,D.Sc., IEEE Fellow
Józef Modelski, Prof.,D.Sc., IEEE Fellow

Zbigniew Kulka, Prof.,D.Sc.,
A. Aronowski, P. Nykiel
Silver Medal - 49-th World Exhibition of Innovation, Research and New Technology: *Brussels Eureka 2000* (Brussels, Belgium, December 2000), and Medal of International Foundation for Science: *Eureka International* (December 2000) for the project of level - dependent ear - muffs.

Krzysztof Derzakowski, Ph.D.
The Best Paper Award which were considered by Editorial and International Advisory Board Members of Measurement Science & Technology Journal for the article: „*Complex permittivity of some ultralow loss dielectric crystals at cryogenic temperatures*” (May 2000).

Józef Modelski, Prof.,D.Sc.,
IEEE Third Millenium Medal

10.2 State Orders and Medals

Józef Modelski, Prof.,D.Sc.,
Krzyż Kawalerski Orderu Odrodzenia Polski

Marian Kazubek, Ph.D.,
Golden Order of Merit

10.3 Awards of the Minister of National Education

Stanisław Rosłonec, Prof.,D.Sc.,
Individual award for the monograph *Linear microwave circuits, methods of analysis and synthesis* (Liniowe obwody mikrofalowe, metody analizy i syntezy).

Władysław Skarbek, Prof.,D.Sc.,
K. Ignasiak, A Krupiczka
Team award for two monographs: *Multimedia - Hardware and Software* (Multimedia - sprzęt i oprogramowanie), *Multimedia - Algorithms and Compression Standards* (Multimedia - algorytmy i standardy kompresji), and outstanding achievements in the promotion of multimedia technology.

10.4. Awards of the Minister of Telecommunications

Józef Modelski, Prof.,D.Sc.,
Jacek Cichocki, Ph.D.,
Jerzy Kołakowski, Ph.D.,
Maciej Konwicky, M.Sc.,
Krzysztof Kowalski, Ph.D.,
Merited for Communications - ”Zasłużony dla Łączności”

10.5 Award of the Minister of Labour and Social Policy

Ewa Kotarbińska
Team award (III⁰) for the research project „*Design of danger signal generation system in a real industrial hall*” (Opracowanie systemu sygnalizacji dźwiękowej w rzeczywistym wnętrzu przemysłowym).

10.6 Awards granted by NOT (Chief Technical Organisation) and a newspaper „Rzeczpospolita”

Wojciech Gwarek, Prof.,D.Sc.,
Małgorzata Celuch-Marcysiak, Ph.D.,
Maciej Sypniewski, Ph.D.,
Andrzej Więckowski, Ph.D.,
Team award (I⁰) for the research project connected with the set of electromagnetic simulators. The staff were also awarded to the title „*Master of Technology*”.

Ryszard Leoniak, M.Sc.,
Andrzej Podgórski, Ph.D.,
Team award (II⁰) for the research project connected with the equipment for four-channel measurement of sound and vibrations.

10.7 Award granted by KBN (The State Committee for Scientific Research) and a TV programme „Proton”

Wojciech Gwarek, Prof.,D.Sc.,
Małgorzata Celuch-Marcysiak, Ph.D.,
Maciej Sypniewski, Ph.D.,
Andrzej Więckowski, Ph.D.,
Team award for the research project connected with electromagnetic analysis of microwave circuits, and „Proton” statuette, as well.

10.8 Awards of the Rector

Jacek Wojciechowski, Prof.,D.Sc.,
J. Cichocki, W. Kazubski, A. Podgórski, K. Radecki,
H. Chaciński, J. Kołakowski, K. Snopek,
D. Grabowski, S. Maszczyk
Team award for the didactic project called *Radiocommunication Laboratories*.

Tadeusz Morawski, Prof.,D.Sc.,
W. Wojtasiak, D. Gryglewski, R. Michnowski,
M. Lubiejewski
Team award for the research project „*Design and Construction of Noise Sources for L-band and S-band*” (Opracowanie i wykonanie źródeł szumów mikrofalowych na pasmo L i S).

Jerzy Kołakowski, Ph.D.,
Mirosław Lubiejewski
Individual awards of the Rector for the engineering and technical staff.

10.9 Awards received by the Ph.D. Students for the best conference papers

Piotr Bobiński, M.Sc.,

The first award for the conference paper *Watermarking techniques in multimedia transmission* (Techniki znaków wodnych w transmisji obiektów multimedialnych), Proc. Conference; Systems and Technologies in Multimedia Telecommunications (Łódź, Poland, Mar. 14-15, 2000).

Stanisław Maszczyk, M.Sc.,

The second award for the conference paper *Application of vector signal analysis in CDMA investigation* (Wykorzystanie wektorowej analizy sygnałów w badaniach sygnałów CDMA), Proc. V-th National Conference on Radiodiffusion and Radiocommunications (Poznań, Poland, Jun. 6-8, 2000).

Krzysztof Mroczek, M.Sc.,

The first award for the conference paper *Parallel piped architecture for implementation of orthogonal transform for arbitrary shaped objects* (Architektura potokowo - równoległa do realizacji ortogonalnych transformacji obiektów o dowolnych kształtach), Proc. VII-th Symposium; New Trends in Audio Technology: Multimedia - Audio and Video Technology (Warsaw, Poland, Oct. 6-7, 2000).

11. STATISTICAL DATA

SPECIFICATION	1997	1998	1999	2000
academic staff				
total	59,5	60,7	62,73	60,23
full professors	4	4	4,5	4
professors	7	7	6	7
assistant professors	32,5	38,5	42,5	41
senior lecturers	4	5,30	4,83	6,33
lecturers	3	2,90	2,9	0,9
assistants	9	3,00	2	1
Ph.D. students				
total	26	36	39	50
regular	21	27	28	25
regular, the third level studies			3	12
part-time	5	9	8	13
technical and administrative staff				
total	35,25	27,00	25,00	24,50
R&D associates	15,25	15,00	14	13,5
administrative associates	8	9	9	9
service workers	2	3	2	2
space				
total	2415,1	2415,1	2549,1	2549,1
laboratories	1038,3	1038,3	1172,8	1172,8
library	71,2	71,2	71,2	71,2
offices of academic staff	1305,6	1305,6	1305,6	1305,6
computers				
total	164	218	291	334
workstations	4	4	5	6
personal computers (PC 486 and better)	160	214	286	328
library resources				
books (number of volumes)	12657	12866	13629	14103
books (number of titles)	7251	7418	7624	7765
journals (number of titles subscribed to)	28	30	59	125
teaching activities				
basic courses	36	28	27	27
advanced courses	40	50	45	51
other courses	23	11	25	51
international projects	4	3	2	2
research projects				
total	63	51	49	46
granted by the University	23	25	27	22
granted by the State institutions	12	10	7	10
other projects	28	16	15	14
consulting				1
titles and degrees awarded				
Ph.D. degrees	4	6	3	1
M.Sc. degrees	46	63	46	65
B.Sc. degrees	0	3	10	52+24
publications				
total	111	120	119	164
sci.-tech. books and chapters in books	7	15	15	3
sci.-tech. papers in journals	28	22	23	22
sci.-tech. papers in conference proceedings	70	66	68	122
textbooks	1	2	2	1
other publications	5	15	11	16
research reports	21	35	45	48
patents granted	1	1	3	0
conferences				
number of conferences attended by the staff	35	37	39	41
number of participants from the Institute	77	62	94	140

