



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



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From the Director

Looking back at the year 1999, I feel justified to say that the Institute of Radioelectronics has climbed a positive spiral of development. We have been successful in numerous challenging projects, both in research and education. And a series of new initiatives have been started, giving us the power to grow in the future. This annual report presents a summary of our recent achievements with an objective to show where we are now, and what we are heading for. We do hope that to many of the readers this will be a convincing invitation to study in our Institute, to collaborate with us in research, or to support our activities.

A unique feature of the Institute of Radio electronics is a diversity of pursued research fields, which gives us a wide perspective and a firm platform for addressing the current requirements of our industrial and public environment. For many years we have been involved in the domains of electro acoustics and electromagnetic, nuclear and biomedical engineering, radio communications and television, signal processing and monitoring systems. During the last year, we have concentrated on deepening two specific areas of expertise: Radio Frequency Engineering and Multimedia Technologies.

Investment in Radio Frequency Engineering is a natural choice in the world increasingly dependent on communication. Throughout 1999 we have intensified our efforts and enjoyed an even greater degree of success on the subject than in previous years. Extremely valuable and stimulating has been support received from the Test and Measurement Group of Hewlett-Packard, which I wish to gratefully acknowledge. Their donation worth \$270000 was a complete new laboratory for Measurements in Radio communication, comprising several state-of-art instruments now widely used by our scientific staff and advanced students.

In the field of Multimedia Technologies, our ongoing grant „Virtual Laboratory Accessible via Internet" has continued to produce new tools for research and education. These results enhance the Institute's multimedia profile, and increase its competitiveness among the young people.

Many ways can be used to measure the annual scientific results of an institute. Further in this report you will find extensive listings of our 108 publications, 49 projects, and 45 reports. Noteworthy are several invited papers, unquestionable proof of international recognition.

But let me emphasise that the most important element of the Institute's activity are people - our intellectual capital. The Institute of Radioelectronics comprises excellent staff and continues to attract expert applicants. We now have 11 professors, renown in Poland and abroad, and 43 assistant professors. Their scientific accomplishments have gained several awards, the most prestigious one being Prime Minister's Award to the group of Prof. Gwarek.

Members of our staff are also devoted teachers, sharing their knowledge and encouraging creativity. We all believe that education must be interactivated, and that the development of our laboratory basis well serves this purpose. In 1999, besides the already mentioned enhancement of radiocommunication laboratories, we acquired computerised tomograph and ultrasonograph, and modernised our computer network with new hardware.

Alongside with undergraduate, graduate and doctoral courses, the Institute of Radioelectronics is deeply involved in the scheme of continuous education. This way we can communicate our knowledge to more people, from more backgrounds, regardless of whether they come directly from a secondary school or have years of professional experience in industry or commerce. In 1999 our short courses and part-time studies concentrated on radiocommunications, and covered such topics as GSM/DCS systems or contemporary measuring and controlling systems. Our offer will remain valid and be extended in subsequent years.

We are firmly determined to continue our development and to encourage more development around us, for the benefit of society. We are most grateful to our partners, sponsors, and friends who help us strive for our ideals.

Warsaw, February 2000

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

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This Annual Report summaries the research activities of the Institute in 1999, as well as the teaching activities of the academic year 1998/99

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 run result-oriented projects; to provide problem-related teaching; and to conduct in-depth research that serves to identify challenges of newcoming technologies as well as anticipated societal benefits.

As implicit in its name, the Institute's competence spans the whole the broad field of radioelectronics. Yet its actual efforts concentrate as a function of current industrial or public demands, and in the course of this academic year two subjects have been focal:

- Radiocommunications,
- Multimedia Technologies,

These choices pertain to both reasearch and teaching, since a synergy of both is the most effective key to success. Indeed, while the above specialisations have begun to attract a growing interest among the students, the Institute has been ready to accept a leading role in their teaching within the Faculty. The greatest related accomplishment of 1999 has been modernisation of laboratories. A new Laboratory for Measurements in Radiocommunication, donated by Hewlett-Packard Test and Measurements Group, comprises state-of-art instruments such as vector signal analyser, GSM and CDMA mobile station testers, network and spectrum analysers, and signal generators. The Biomedical Engineering Laboratory has acquired a computerised tomograph and ultrasonograph. 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.

The coherence between the Institute's offer and the candidates' expectations results in an increasing number of B.Sc., M.Sc. (56 in 1999) and Ph.D. theses being prepared within the Institute as well as an increasing number of Ph.D. students (nearly 40). Education is supervised by the Institute's experienced staff including 11 professors (relatively young, dynamic, and renown worldwide) and 43 assistant professors. Sharing their knowledge and experience, they also have an ambition to promote standards of excellence and stimulate innovation. The Institute's graduates have proven competitive on the demanding job market, finding employment in telecommunications services, mobile communications, information technology, television, and also in public services. In both teaching and research, the Institute is strongly anchored within the Faculty, though in many aspects it has gained a special position.

Firstly, as already mentioned, its general field of competence is extremely wide and includes:

- 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 emisson 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.

Secondly, the Institute aims to cover the full process of technological development, generating innovative ideas, converting them into engineering projects, and eventually constructing prototypes and short series of novel instrumentation. 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,
- measuring systems for applications in industry, nuclear engineering for scientific research, and medicine.

Industrial relevance of the R&D works is ensured by close collaboration with industrial partners. The Institute of Radioelectronics carries out a majority of tasks under two big contracts signed by the University with the Polish Television SA and ALCATEL. It also has a direct long-term contract with the Polish Telecommunications SA as well as contracts with National Radiocommunication Agency PAR, National Railways, Central Institute for Labour Protection, military institutions, and many others.

These industrial and public links are further strengthened by the Institute's involvement in continuing education. The courses are addressed to technical staff from a number of dynamically developing Polish businesses such as telecommunications network operators, mobile communication companies, banks, local and governmental organisations. The 1999 offer included:

- Part-time Studies on Radiocommunication;
- Postgraduate Courses on Radiocommunication;
- Studies on Audiological Techniques;
- Courses on Surface Assembly - Designing and Technology;
- Courses on Cable Television;
- Coures on Law in Radiocommunication;
- Courses on Access Network Systems;
- Courses on Basics of Telecommunication;
- Courses on Teletransmission Systems;
- Courses on Technical Aspects of GSM System.

International dimension of the Institute's activities is the last aspect that should be addressed here. Accomplishments of several research groups have gained world-wide recognition as exemplified by their invitated papers in prestigious journals and invited presentations at high-ranking conferences. Direct cooperation has been developed with many foreign institutions.

1.2. Board of Directors

Director of the Institute:

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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 Engineering Division;
- Nuclear and Medical Electronics Division.

The structure of the Institute includes the Laboratory for Testing of Audio-Visual Equipment 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

Adam Fiok, D.Sc.	Tenured Professor, (0.5)
Tomasz Buczkowski, Ph.D.	Assistant Professor
Henryk Chaciński, M.Sc.	Senior Lecturer
Jacek Cichocki, Ph.D.	Assistant Professor
Krzysztof Czerwiński, Ph.D.	Assistant Professor
Stefan Hahn, D.Sc.	Professor (emeritus)
Krzysztof Imielowski, Ph.D.	Assistant Professor (on the leave)

Jacek Jarkowski, Ph.D.	Assistant Professor
Wojciech Kazubski, Ph.D.	Assistant Professor
Tomasz Kosiło, Ph.D.	Assistant Professor
Waldemar Kiełek, D.Sc.	Associate Professor (emeritus)

Karol Radecki, Ph.D.	Assistant Professor
Błażej Sawionek, Ph.D.	Assistant Professor (from 1.07.99)

Junior academic staff

Fathi Ali Alwafie, M.Sc.	Ph.D. Student
Dariusz Grabowski, M.Sc.	Ph.D. Student
Dariusz Janusek, M.Sc.	Ph.D. Student
Stanisław Maszczyk, M.Sc.	Ph.D. Student
Marcin Piasecki, M.Sc.	Ph.D. Student

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

Technical staff

Jerzy Kołakowski, M.Sc.
Stanisław Żmudzin, M.Sc. (0.5)

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

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

Current research topics include:

- theory and applications of multidimensional complex signals,
- application of Hilbert transform for antenna radiation pattern forming and optimising,
- digital modulations broadcasting in AM bands,
- application of GDS for selected geodetic measurements,
- health and environmental aspects of electronics,
- GSM-R system for railway company,
- fault detection in electronic systems,
- simulation and design of networks,
- development of mobile radiomonitoring systems,
- training in cellular systems,
- power converters.

1.3.2. Television Division

Head of Division

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Senior academic staff

Władysław Skarbek, D.Sc.	Professor
Andrzej Buchowicz, Ph.D.	Assistant Professor
Krzysztof Derzakowski, Ph.D.	Assistant Professor
Krzystian Ignasiak, Ph.D.	Assistant Professor (from 8.11.99)
Yevhen Yashchychyn, Ph.D.	Assistant Professor (from 1.10.99)
Jerzy Kondarewicz, M.Sc.	Senior Lecturer (0.5 from 1.11.99)
Zdzisław Kozłowski, Ph.D.	Senior Lecturer (0.5 to 30.09.99)
Andrzej Krupiczka, Ph.D.	Assistant Professor
Marek Rusin, Ph.D.	Assistant Professor (0.5)

Junior academic staff

Tomasz Krzymień, M.Sc.	Lecturer
Jakub Gabryś, M.Sc.	Ph.D. Student
Grzegorz Galiński, M.Sc.	Ph.D. Student

Artur Gałat, 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
Nguyen Minh, M.Sc.	Ph.D. Student
Krzysztof Mroczek, 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
Piotr Sokołowski, M.Sc.	Ph.D. Student
Mulugeta Tsegaye, M.Sc.	Ph.D. Student
Karol Wnukowicz, M.Sc.	Ph.D. Student

Technical staff

Tomasz Smakuszczyński, 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 1999 included:

- image compression techniques - wavelet transform; vector quantisation, high compression ratio algorithms;
- algorithms of image motion detection and estimation;
- non-linear filters for colour image processing;
- intelligent multimedia systems - object tracking and recognition, compression controlled by segmentation, semantic preserving compression methods;
- 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.

1.3.3. Electroacoustics Division

Head of Division

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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 (on the leave)
Piotr Kwiecień, M.Sc.	Ph.D. Student
Piotr Nykiel, M.Sc.	Ph.D. Student
Radosław Smoliński, M.Sc.	Ph.D. Student

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 audiosignal 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;
- ultrasonic transducers and devices;
- acoustic emission.

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

1.3.4. Radio-Engineering Division

Head of Division

Jan Ebert, D.Sc., Tenured Professor
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Senior academic staff

Roman Z. Morawski, D.Sc.	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 Winiecki, Ph.D.	Assistant Professor

Junior academic staff

Robert Łukaszewski, M.Sc.	Assistant
Piotr Bobiński, M.Sc.	Ph.D. Student
Piotr Kluk, M.Sc.	Ph.D. Student
Adam Osytek, 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.
 Andrzej Owczarek, 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 of measurement-signal processing,

methods for reconstruction of measurands and methods 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 the natural environment;
- portable signal analysers for technical diagnostics and the monitoring of the natural environment.

1.3.5. Microwave Engineering Division

Head of Division

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Senior academic staff

Wojciech Gwarek, D.Sc.	Professor
Stanisław Rosłonec, D.Sc.	Professor
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
Dariusz Górlicki, M.Sc.	Ph.D. Student
Daniel Gryglewski, M.Sc.	Ph.D. Student
Andrzej Kozak, 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
Konrad Szustak, M.Sc.	Ph.D. Student
Zbigniew Żotnierowicz, 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 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 1999 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, summaters 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 noncommensurate nonsynchronous transmission line stop-band filters and application of them in various radar equipment.

- development of new optimisation 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, antennas);
- 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

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Senior academic staff

Adam Piątkowski, D.Sc.	Professor
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 Smolik, Ph.D.	Assistant Professor
Roman Szabatin, Ph.D.	Assistant Professor
Krzysztof Zaremba, Ph.D.	Assistant Professor
Waldemar Scharf, Ph.D.	Assistant Professor (emeritus)

Junior academic staff

Paweł Błociszewski, M.Sc.	Senior Lecturer (on the leave)
Tomasz Olszewski, M.Sc.	Lecturer
Ewa Piątkowska-Janko, M.Sc.	Lecturer (0,9)
Grzegorz Domański, M.Sc.	Ph.D. Student
Walid Al Him, 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;
- magnetic resonance imaging;
- analogue and digital radiography,
- medical image processing and recognition;

- methods and instrumentation for electrocardiography and electroencephalography;
- 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;
- application of vector space transformations for improving the quality of ECG recorded signals;
- 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;
- 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

Konrad Adamowicz

M.Sc. ('64), Ph.D. ('76); measurement and instrumentation; Assistant Professor, Radio-Engineering Division; Scientific Secretary of the Metrology and Instrumentation Committee, Polish Academy of Sciences ('93-'96); Member of the Education Commission of the Metrology and Instrumentation Committee, Polish Academy of Sciences ('93-'96); Member of the Measurement Committee of the Polish Society for Measurement, Automatic Control and Robotics POLSPAR ('92-); award of the Minister of Education for research results (1997); [Edu54], [Edu97]; [Pro9]; [MSc35]; [BSc3], [BSc5]; [Rep38]

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Paweł S. Błociszewski

M.Sc. ('85); biomedical engineering; Senior Lecturer, Medical and Nuclear Electronics Division;

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Piotr Bogorodzki

M.Sc. ('88), Ph.D. ('98); biomedical engineering; Assistant Professor, Medical and Nuclear Electronics Division; individual award of the Minister of Education ('99); [Edu8], [Edu9], [Edu14], [Edu18], [Edu61], [Edu63], [Edu114]; [Pro7], [Pro33], [Pro34]; [BSc6]; [Pub52]; [Rep1], [Rep31], [Rep32]; [Con18]

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e-mail: P.Bogorodzki@ire.pw.edu.pl*

Piotr A. Brzeski

M.Sc. ('70), Ph.D. ('82); biomedical engineering; Assistant Professor, Nuclear and Medical Electronics Division; Deputy Director for Academic Affairs of the Institute of Radioelectronics ('93-); Member of the Faculty Council ('90-); Member of the Dean's Financial Committee ('93-); Member of the European Association of Nuclear Medicine ('89-); team award of the Minister of Education ('99); [Edu12], [Edu39], [Edu51]; [Pro7]; [MSc8], [MSc24]; [Pub39], [Pub101]; [Rep31]

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excellence in scientific research ('99); [Edu20]; [Pro2], [Pro6]; [MSc11]; [Pub108]; [Rep27], [Rep37]; [Con30]

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research group on networks and discrete optimisation. Member of the Faculty Council. Member of FEIT Committee on Education. Member of the Circuit Theory and Signal Processing Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences. Member of the Scientific Committee of: the National Conference on Circuit Theory and Electronics Systems, Conference on Evolutionary Algorithms and Global Optimization, Member of the Council of the Research and Promotion Center for Power Electronics ('97-), Member of the Council of the Foundation for Development of Radiocommunication and Multimedia Technology ('99-), Coordinator of the cooperation agreement between WUT and University of Waterloo, Canada and WUT and Ohio University, USA; [Edu26], [Edu66], [Edu71]; [Pro1], [Pro20], [Pro24], [Pro28]; [MSc37]; [PhD3]; [Pub49], [Pub93], [Pub111], [Pub115], [Rep40], [Rep41], [Rep42], [Rep43]; [Con12], [Con23], [Con24], [Con30]

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2.2. Junior academic staff

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Tomasz Olszewski, M.Sc.	Lecturer (0.5) <i>phone: 660-7577</i>
Jan Paluchowski, M.Sc.	Assistant <i>phone: 660-7637</i>
Ewa Piątkowska-Janko, M.Sc.	Lecturer <i>phone: 660-7918</i>
Fathi Ali Alwafie, M.Sc.	Ph.D. Student
Walid Al Him, M.Sc.	Ph.D. Student
Mirosław Andrzejewski, M.Sc.	Ph.D. Student
Dariusz Bednarczyk, M.Sc.	Ph.D. Student
Piotr Bobiński, M.Sc.	Ph.D. Student
Grzegorz Domański, M.Sc.	Ph.D. Student
Jakub Gabryś, M.Sc.	Ph.D. Student
Grzegorz Galiński, M.Sc.	Ph.D. Student
Artur Gałat, M.Sc.	Ph.D. Student
Dariusz Górlicki, M.Sc.	Ph.D. Student
Dariusz Grabowski, M.Sc.	Ph.D. Student
Daniel Gryglewski, M.Sc.	Ph.D. Student
Dariusz Janusek, M.Sc.	Ph.D. Student
Piotr Kluk, M.Sc.	Ph.D. Student
Andrzej Kozak, M.Sc.	Ph.D. Student
Marek Kukier, M.Sc.	Ph.D. Student
Krzysztof Kurek, M.Sc.	Ph.D. Student
Piotr Kwiecień, M.Sc.	Ph.D. Student
Maciej Łempkowski, M.Sc.	Ph.D. Student
Jacek Marzyjanek, M.Sc.	Ph.D. Student
Stanisław Maszczyk, M.Sc.	Ph.D. Student
Ryszard Michnowski, M.Sc.	Ph.D. Student
Nguyen Minh, M.Sc.	Ph.D. Student
Krzysztof Mroczek, M.Sc.	Ph.D. Student
Cezary Niedziński, M.Sc.	Ph.D. Student
Piotr Nykiel, M.Sc.	Ph.D. Student
Adam Osytek, 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
Michał Rosiński-Potocki, M.Sc.	Ph.D. Student
Wojciech Sadowski, M.Sc.	Ph.D. Student
Radosław Smoliński, M.Sc.	Ph.D. Student
Kajetana Snopek, M.Sc.	Ph.D. Student
Paweł Sokołowski, M.Sc.	Ph.D. Student
Piotr Sprzęczak, M.Sc.	Ph.D. Student
Tomasz Szafrąski, M.Sc.	Ph.D. Student
Konrad Szustak, M.Sc.	Ph.D. Student
Mulugeta Tsegaye, M.Sc.	Ph.D. Student
Andrzej Wajs, M.Sc.	Ph.D. Student
Zbigniew Walczak, M.Sc.	Ph.D. Student
Karol Wnukowicz, M.Sc.	Ph.D. Student
Tomasz Wolak, M.Sc.	Ph.D. Student
Zbigniew Żolnierowicz, M.Sc.	Ph.D. Student

2.3. Technical and administrative staff

Aneta Bielska	Secretary <i>phone:660-7233,8253929</i>	Helena Oleksak	<i>phone:660-7829,8255248</i> Section Manager
Janina Chmielak	Senior Technician <i>phone: 660-7479</i>	Tomasz Olszewski, M.Sc.	<i>phone:660-7957,8253769</i> Senior R&D Engineer-0.5
Dariusz Ćwiek, M.Sc.	Senior Development Engineer <i>phone: 660-7577</i>	Andrzej Owczarek, M.Sc.	<i>phone: 660-7577</i> Senior Development Engineer
Janina Gałęcka	Senior Accountant <i>phone: 660-7645</i>	Anna Pietras-Makoś	<i>phone: 660-7793</i> Accountant
Jerzy Kołakowski, M.Sc.	R&D Engineer <i>phone: 660-7635</i>	Andrzej R. Podgórski, M.Sc.	<i>phone: 660-7743</i> Senior R&D Engineer
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Krzysztof Kowalski, Ph.D.	Senior R&D Engineer-0.5 <i>phone: 660-7626</i>	Andrzej Skrzypkowski	<i>phone: 660-7622</i> Foreman
Bogdan Kwiatkowski, M.Sc.	Senior R&D Engineer <i>phone: 660-5367</i>	Tomasz Smakuszewski, M.Sc.	<i>phone: 660-7378</i> R&D Engineer
Andrzej Laskowski	Worker <i>phone: 660-7957</i>	Hanna Szot	<i>phone: 660-7840</i> Accountant
Ryszard Leoniak, M.Sc.	Senior R&D Engineer <i>phone: 660-7946</i>	Anna Tratkiewicz	<i>phone: 660-7743</i> Secretary
Mirosław Lubiejewski	Foreman <i>phone: 660-7633</i>	Andrzej Wasilewski	<i>phone:660-7233,8253929</i> Worker
Teresa Miąsek, M.Sc.	Curator of the Library <i>phone: 660-7627</i>	Joanna Witkowska	<i>phone: 660-7919</i> Senior Technician
Danuta Morawska	Secretary <i>phone:660-7829,8255248</i>	Stanisław Żmudzin, M.Sc.	<i>phone:660-7955,8251363</i> Senior R&D Engineer -0.5
Anna Noińska	Secretary		<i>phone: 660-7635</i>

3. TEACHING ACTIVITIES (academic year 1998/1999)

3.1. Basic courses

- [Edu1] *Detection of Nuclear and Medical Signals* (Detekcja sygnałów biomedycznych i jądrowych - DSBJ); 4h/week; semester 6; Z. Pawłowski.
- [Edu2] *Electronics III* (Elektronika III - ELKAIII); 2h/week; semester 4; T. Olszewski.
- [Edu3] *Medical Electronic Instrumentation - Lab.* (Elektroniczna aparatura medyczna - EAME); 4h/week; semester 5-semester 6 L. Padee.
- [Edu4] *Materials, Components, Designs* (Materiały, elementy i konstrukcje - MEIK); 1h/week, K. Radecki.
- [Edu5] *Numerical Methods* (Metody numeryczne - MNM); 3h/week; semester 3; R. Z. Morawski.
- [Edu6] *Radiology and Nucleonics* (Radiologia z Nukleoniką - NK); 3h/week; semester 5; W. Scharf.
- [Edu7] *Orientation 1* (Orientacja 1 - OR1); 1h/week; semester 1; W. Gwarek.
- [Edu8] *Orientation 2* (Orientacja 2 - OR2); 1h/week; semester 2; P. Bogorodzki.
- [Edu9] *Orientation 3* (Orientacja 3 - OR3); 1h/week; semester 3; P. Bogorodzki, M. Mikołajewski, A. Buchowicz.
- [Edu10] *Orientation 4* (Orientacja 4 - OR4); 1h/week; semester 4; E. Piątkowska-Janko, M. Tajchert, A. Buchowicz.
- [Edu11] *Orientation 5* (Orientacja 5 - OR5); 1h/week; semester 5; E. Piątkowska-Janko, R. Szabatin, M. Tajchert.
- [Edu12] *Orientation 6* (Orientacja 6 - OR6); 1h/week; semester 6; P. Brzeski.
- [Edu13] *Basics of Electroacoustics* (Podstawy elektroakustyki - PEA); 3h/week; semester 6; A. Leszczyński, J. Narkiewicz-Jodko.
- [Edu14] *Basics of Computer Technique* (Podstawy techniki komputerowej - PTKO); 4h/week; semester 1; A. Więckowski.
- [Edu15] *Basics of High-Frequency Technique - Lab.* (Podstawy techniki w.cz. - TWCZ); 2h/week; semester 4; W. Wojtasiak.
- [Edu16] *Basics of Television* (Podstawy telewizji - PT); 3h/week; semester 6; Z. Kozłowski.
- [Edu17] *Fields and Waves* (Pola i fale - POFA); 3h/week; semester 3; T. Morawski, W. Gwarek.
- [Edu18] *Programming* (Programowanie - PROG); 5h/week; semester 2; A. Podgórski.
- [Edu19] *Programming 2* (Programowanie 2 - PROG2); 3h/week; semester 5; W. Smolik.

- [Edu20] *Operating Systems* (Systemy operacyjne - SOP); 3h/week; semester 5; M. Sypniewski.
- [Edu21] *Measuring Systems* (Systemy pomiarowe - SPOM); 6h/week; semester 5; W. Winiecki.
- [Edu22] *Measuring Systems I* (Systemy pomiarowe I - SPOM); 4h/week; semester 5; W. Winiecki.
- [Edu23] *Measuring Systems II* (Systemy pomiarowe II - SPOM); 4h/week; semester 6; W. Winiecki.
- [Edu24] *Microprocessor Techniques* (Podstawy techniki mikroprocesorowej - TMIK); 4h/week; semester 5; K. Czerwiński.
- [Edu25] *Computer Networks* (Sieci komputerowe - SKP1); 1h/week; semester 5; J. Marzec.
- [Edu26] *Signals and Systems* (Sygnały i Systemy - SIS/IPE); 4h/week+laboratory; semester 3; J. Wojciechowski.
- [Edu27] *Theory of Signals and Modulations* (Teoria sygnałów i modulacji - TSIM); 4h/week; semester 4; T. Kosiło.

3.2 Advanced courses

- [Edu28] *Environmental Acoustics* (Akustyczna ochrona środowiska - AOS); 3h/week; E. Kotarbińska.
- [Edu29] *Measured Data Analysis* (Analiza danych pomiarowych w medycynie - ADP); 3h/week; Z. Pawłowski.
- [Edu30] *Analysis and Synthesis of Microwave Circuits* (Analiza i synteza układów mikrofalowych - ASUM); 3h/week; S. Rostłonec.
- [Edu31] *Semantic Analysis of Images and Sounds* (Analiza semantyczna obrazu i dźwięku - ASOD); 3h/week; W. Skarbek.
- [Edu32] *Ultrasonography Instrumentation* (Aparatura ultrasonograficzna-AUS); 3h/week; L. Padee.
- [Edu33] *Digital Data* (Cyfrowa transmisja informacji - CTIN); 3h/week; T. Buczkowski, T. Kosiło.
- [Edu34] *Digital Processing of Measurement Signals* (Cyfrowe przetwarzanie sygnałów pomiarowych - CPSP); 3h/week; R. Z. Morawski.
- [Edu35] *Biomedical Signals - Processing* (Cyfrowe przetwarzanie sygnałów biologicznych - CPSB); 4h/week; E. Piątkowska-Janko -lab.
- [Edu36] *Digital Circuits* (A13); 2h/week; P. Miazga.
- [Edu37] *Electromagnetic Compatibility* (Kompatybilność elektromagnetyczna - KE); 2h/week; W. Gwarek.
- [Edu38] *Antennae and Radiowave Propagation* (Anteny i propagacja fal - AIPF); 3h/week; elective; J. Jarkowski.

- [Edu39] *Digital Image Processing* (Cyfrowe przetwarzanie obrazów - CPOO); 4h/week; elective; M. Kazubek.
- [Edu40] *Programmable Digital Systems* (Cyfrowe układy programowalne - CUP); 5h/week; elective; K. Czerwiński, T. Olszewski.
- [Edu41] *Data Compression 2* (Kompresja danych 2 - KODA2); 3h/week; elective; A. Przelaskowski.
- [Edu42] *Methods and Algorithms for Processing Measurement Signals* (Metody i algorytmy przetwarzania sygnałów pomiarowych - MAP); 3h/week; elective; R. Z. Morawski.
- [Edu43] *Methods and Equipment for Organ Structure Visualisation* (Metody i urządzenia do wizualizacji struktur narządowych - MWSN); 3h/week; elective; R. Szabatin.
- [Edu44] *Radioelectronics Measurements* (Miernictwo radioelektroniczne - MR); 3h/week; elective; A. Fiok, J. Cichocki.
- [Edu45] *Noise Control* (Ochrona przed hałasem); 2h/week; E. Kotarbińska.
- [Edu46] *Software for medical Systems* (Oprogramowanie systemów medycznych - OSM); 3h/week; elective; W. Smolik.
- [Edu47] *Measuring Systems Software* (Oprogramowanie systemów pomiarowych - OSP); 4h/week; elective; W. Winiecki.
- [Edu48] *Basics of Radiocommunications* (Podstawy radiokomunikacji - PRR); 3h/week; elective; T. Kosito.
- [Edu49] *Basics of Radiolocation and Navigation* (Podstawy radiolokacji i nawigacji - PRIR); 3h/week; S. Rostoniec.
- [Edu50] *Basics of Multimedia Techniques* (Podstawy technik multimedialnych - PTMU); 3h/week; W. Skarbek.
- [Edu51] *Basics of Medical Imaging Techniques* (Podstawy technik obrazowania w medycynie - PRIR); 4h/week; P. Brzeski.
- [Edu52] *Mobile Radio Communication* (Radiokomunikacja ruchoma lądowa - RRL); 3h/week; elective; T. Kosito.
- [Edu53] *GSM System* (System telefonii komórkowej GSM); 4h/week; elective; J. Cichocki.
- [Edu54] *System Measuring and Controlling Devices* (Systemowe urządzenia pomiarowe i sterujące - SUPS); 4h/week; elective; K. Adamowicz.
- [Edu55] *Signal Transmitting and Receiving* (Technika nadawania i odbioru - TNO); 2h/week; elective; J. Ebert.
- [Edu56] *Cable Television* (Telewizja przewodowa - TVP2); 3h/week; elective; J. Modelski.
- [Edu57] *Satellite Communication* (Łączność satelitarna - ŁS); 3h/week; elective; J. Modelski.
- [Edu58] *Microwave Technique* (Technika mikrofalowa - TMO); 3h/week; J. Zborowska.
- [Edu59] *Technique of a Television Receiving* (Technika odbioru telewizyjnego - TOT); 3h/week; M. Rusin.
- [Edu60] *Radio Transmitting Technique and its Applications* (Technika nadawania radiowego i jej aplikacje - TNR); 4h/week; J. Modzelewski, M. Mikołajewski.
- [Edu61] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej - TNN); 4h/week; R. Szabatin.
- [Edu62] *Electromagnetic Field Theory* (Teoria pola elektromagnetycznego - TPE); 4h/week; T. Morawski.
- [Edu63] *Computed Tomography* (Tomografia komputerowa - TOM); 4h/week; J. Mirkowski.
- [Edu64] *Digital Circuits - Lab.* (Układy logiczne - UKLO); 2h/week; semester 4; P. Miazga.
- [Edu65] *Contemporary Applications of Microwaves* (Współczesne zastosowania mikrofal - WZN); 3h/week; elective; J. Modelski.
- [Edu66] *Graphs and Networks* (Grafy i Sieci - GIS); 4h/week; J. Wojciechowski.
- [Edu67] *Digital Audio* (Foniczna technika cyfrowa); 3h/week; Z. Kulka.
- [Edu68] *Computer Systems* (Systemy komputerowe); 3h/week; T. Jamrógiwicz.
- [Edu69] *Theory and Antennae Design* (Teoria i projektowanie anten); 4h/week; J. Jarkowski.
- [Edu70] *Digital Information Transmission* (Cyfrowa transmisja informacji - CTIN); 2h/week, project: 1h/week; T. Kosito.
- [Edu71] *Artificial Neural Networks in Medicine* (Sztuczne sieci neuronowe w medycynie - SESN2); 3h/week; elective; K. Zaremba.

3.3. Courses for part-time studies on Radiocommunication

- [Edu73] *Basics of Computer Techniques* (Podstawy Techniki Komputerowej - PTKR); 70h/sem.; semester 1; J. Marzec.
- [Edu74] *Basics of Metrology* (Podstawy Metrologii - PMER); 40h/sem.; semester 1; W. Winiecki.
- [Edu75] *Fields and Waves* (Pola i fale - PFR); 72h/sem.; semester 2; T. Morawski.
- [Edu76] *Numerical Methods* (Metody Numeryczne - MNR); 35h/sem.; semester 3; S. Rostoniec.
- [Edu77] *Basics of High-Frequency Techniques* (Podstawy Techniki w.cz. - PTWR); 65h/sem.; semester 3; K. Kowalski.
- [Edu78] *Programming* (Programowanie - PMR); 32h/sem.; semester 3; W. Smolik.

- [Edu79] *Technique of Emission and Receiving* (Technika emisji i odbioru - TER), 40h/sem., semester 4, J. Modzelewski, W. Kazubski.
- [Edu80] *Basics of Digital Circuits and Microprocessing Technique* (Podstawy układów logicznych i techniki mikroprocesorowej - PULR), 55h/sem., semester 4, K. Czerwiński.
- [Edu81] *Antennae* (Anteny - ANR), 34h/sem., semester 4, S. Rosłoniec.
- [Edu82] *Basics of Satellite Communication* (Podstawy łączności satelitarnej - SATR), 20h/sem., semester 4, J. Modelski.
- [Edu83] *Propagation of Waves* (Propagacja fal - PFR), 16h/sem., semester 4 J. Jarkowski.
- [Edu84] *Materials and Elements* (Materiały i elementy - MER), 16h/sem., semester 4, K. Radecki.
- [Edu85] *Digital Data Transmission* (Cyfrowa transmisja danych - CTSR), 43h/sem., semester 5, T. Kosiło.
- [Edu86] *Radioelectronics Measurements* (Miernictwo radioelektroniczne - MRR), 42h/sem., semester 5, J. Cichocki.
- [Edu87] *Computed Controlling and Data Processing* (Komputerowe sterowanie i przetwarzanie danych - KSTR), 41h/sem., semester 5, W. Winiński.
- [Edu88] *Programmable Digital Systems* (Programowalne układy cyfrowe - PUCR), 32h/sem., semester 5, T. Buczkowski.
- [Edu89] *Project 1 (systematic)* (Projekt 1- układowy - PUR), 30h/sem., semester 5, K. Kowalski.
- [Edu90] *Radiocommunications systems I* (Systemy radiokomunikacyjne I); 44h/sem., semester 6, T. Kosiło.
- [Edu91] *Access Network Systems* (Systemy dostępu abonenckiego); 21h; RAD, A. Kalinowski.
- [Edu92] *Antennae and Radiowave Propagation* (Anteny i propagacja fal - PF); 16h; SPR; J. Jarkowski.
- [Edu93] *Basics of Telecommunication* (Podstawy telekomunikacji); 25h; RAD, C. Dreger, T. Kosiło, S. Kula.
- [Edu94] *Basics of Fiber Optics Telecommunication* (Podstawy telekomunikacji światłowodowej); 20h; SPR, J. Siuzdak
- [Edu95] *Cable Television* (Telewizja kablowa); 2x40h; RAD, T. Krzymień, K. Kurek, J. Pawłowicz, K. Derzakowski, W. Kazubski,
- [Edu96] *Computer-Aided Radiomonitoring* (Komputerowe monitorowanie emisji - KME); 4h; SPR; J. Cichocki, J. Kołakowski.
- [Edu97] *Computer Controlled Measurement and Data Processing* (Komputerowe sterowanie i przetwarzanie danych - KSP); 28h + 9lab.; SPR; K. Adamowicz, A. Więckowski, W. Winiński.
- [Edu98] *Contemporary Telecommunication Networks* (Współczesne sieci telekomunikacyjne - WST); 20h; SPR; M. Dąbrowski.
- [Edu99] *Digital Cellular Systems* (Cyfrowe systemy komórkowe - CSK); 16h; SPR; J. Cichocki, J. Kołakowski.
- [Edu100] *Digital Signal Transmission* (Cyfrowa transmisja sygnałów - CTS); 28h; SPR; T. Kosiło.
- [Edu101] *Digital Signal Processing* (Cyfrowe przetwarzanie sygnałów - CPS); 16h; SPR; A. Jakubiak.
- [Edu102] *Law in Telecommunication* (Prawo w Telekomunikacji); 3x16h; RAD, C. Woźniak.
- [Edu103] *Law in Telecommunication* (Prawo w Telekomunikacji); 20h; SPR, C. Woźniak.
- [Edu104] *Management and Marketing* (Zarządzanie i marketing); 20h, SPR, L. Białoń.
- [Edu105] *Microprocessor Engineering* (Technika mikroprocesorowa - TMP); 20h; SPR; K. Czerwiński.
- [Edu106] *Modern Radiocommunication and Broadcasting Systems* (Współczesne systemy radiokomunikacyjne i radiofoniczne - WRR); 32h; SPR; T. Kosiło.
- [Edu107] *Radio - Access Systems* (Systemy radiodostępu abonenckiego); 21h; SPR, A. Kalinowski.
- [Edu108] *Radio Links and Satellite Communication* (Linie radiowe i łączność satelitarna - LR); 20h; SPR; J. Zygierewicz.
- [Edu109] *Surface Assembly - Designing and Technology* (Montaż powierzchniowy - projektowanie i technologia); 3x16h; RAD, R. Kisiel, A. Miękina.
- [Edu110] *Technical Aspects of GSM System Development* (Techniczne aspekty rozwoju systemu GSM); 40h; RAD, J. Cichocki, T. Kosiło, J. Kołakowski, T. Krzymień.
- [Edu111] *Theory of E-M Fields and Microwaves* (Problemy teorii pola i techniki mikrofalowej - PTM); 20; SPR; K. Kowalski.
- [Edu112] *Teletransmitting Systems* (Systemy teletransmisyjne); 24h; RAD, S. Kula.
- [Edu113] *Wide-band Systems in Telecommunication* (Systemy szerokopasmowe w telekomunikacji - SST); 16h; SPR; A. Dąbrowski.

3.4. Special courses

Abbreviations used in the description of the courses:

SPR - Postgraduate Course on Radiocommunication

RAD - Courses on Radiocommunication, Electroacoustics and Medical Engineering (RADEM)

3.5. International co-operation

[Edu114] TEMPUS JEP-11117-96: „**The Inter-disciplinary Laboratory of Informatics in Medical Imaging Diagnostics**” (Interdyscyplinarne Laboratorium Zastosowań Informatyki w Obrazowej Diagnostyce Medycznej).

A. Piątkowski, Prof., D.Sc.,
P. Bogorodzki, E. Piątkowska-Janko
1996-1999.

The main objective of the project is the creation of centres for continuing education in applications of informatics in medical imaging diagnostics. The following targets are to be achieved:

- development of new courses in the medical imaging area in curriculum in WUT and Medical Academy;
- practical training for staff and students from WUT and Medical Academy;
- preparation of modern teaching materials like computer programmes, video tapes;
- acquiring of visualisation workstation, network equipment, and specialised hardware for a real time processing, and upgrading of magnet hardware.

[Edu115] SOCRATES Programme: **Higher Education. T. Kosiło, Ph.D.,** T. Buczkowski, Ph.D.
1999-2000.

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 realized in the frame of Electronics and Telecommunications Engineering (Socrates code 06.05). The objective of the programme as 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 programme with Belgium there was also realized 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] **Selected Problems of Data Radio Transmission.** (Radiowa transmisja danych).

Jacek Wojciechowski, Prof., D.Sc.,
J. Jarkowski, H. Chaciński, A. J. Fiok,
J. Cichocki, J. Kołakowski, K. Radecki,
S. Żmudzin, T. Kosiło, T. Buczkowski,
K. Czerwiński, D. Janusek, W. Kazubski
25.05.98-30.04.99.

Results of design and investigations of elliptically polarized millimeter wave antenna arrays are shown. The presented leaky-wave antenna arrays consist of the waveguide structure and finite diffraction grating. The diffraction grating is excited by E type surface wave, which is the eigenwave of the waveguide structure. The diffraction grating consists of rectilinear and parallel nonhomogeneities, which are disposed at an angle of α in the direction of surface wave propagation. The angle α , widths and distances between nonhomogeneities are chosen by using special optimization algorithms in order to receive necessary electrodynamics characteristics.

[Pro2] **Modelling and Designing of Selected Microwave Circuits.** (Modelowanie i projektowanie wybranych układów mikrofalowych).

Tadeusz Morawski, Prof., D.Sc.,
W. Gwarek, S. Rosłonec, M. Celuch-
Marcysiak, K. Kowalski, P. Miazga, M. Syp-
niewski, A. Więckowski, W. Wojtasiak,
J. Zborowska, D. Gryglewski, M. Kukier,
R. Michnowski, K. Robaczyński
25.05.98-30.04.99.

The research works are concentrated on seven subjects:

a) *Switchable multiport system for measuring of microwave two-port parameters.*

Measurement multiport system for determination of scattering parameters of the two-ports have been proposed. Calibration and measuring procedures of the system have been elaborated. The influence of a power measurement error on the determined scattering parameters has been tested.

b) *Electromagnetic modelling of lossy microwave elements.*

Reliable modelling of microwave elements requires incorporation of material losses. The FD-TD method (based on the time- and space-discretisation of the Maxwell equations) can be applied in a straightforward way to lossy dielectrics described by constant value of conductivity. In this work, original extension of FD-TD has been developed which permits accurate modelling of finite-conductivity metals.

c) *Broadband bandstop filters for multielement radar antenna arrays*

A new method for designing broadband bandstop filters intended for high-power radar antenna arrays was worked out. The filters under consideration are

composed of noncommensurate transmission line segments, which characteristic impedances take alternatively lower $Z_{0 \min}$ or upper $Z_{0 \max}$ values. These extreme values are introduced by a designer at the beginning of the design process. The designing of filters consists in varying electrical lengths of their particular sections in order to obtain the required insertion loss function.

d) *New integrated accelerometers – analysis of possible accelerometers in control systems.*

The possibility of applications of new integrated accelerometers in control systems was analysed. Some types of integrated accelerometers were tested. Advantages of integrated accelerometers and possibilities of applications are discussed.

e) *Design of analog, reflection type phase shifters.*

The work was devoted to computer-aided design of the structure of microwave impedance transformers and filters, manufactured in planar technology consisting of uniform transmission line sections. A hybrid algorithm, used for network synthesis consists of two stages. Firstly, a genetic algorithm generates structure topology. Secondly, sub-gradient mini-max algorithm is used for parametric optimisation of the circuit. Presented method was applied for synthesis of multi-octave impedance transformers and filters.

f) *A linearisation method of microwave power amplifiers*

One of the fundamental problems of power amplifiers design is nonlinear distortion level. Some of the basic amplifiers linearisation methods are known in the literature as follows: small signal work (below 1dB compression point), feedback applications, predistortions of the input signal and the push-pull effect. The elaborated method depends on the input and mainly load impedances optimisation of the transistor, in order to minimize the desired distortion level at the output power in 10dB compression region.

[Pro3] **High-Efficiency Power Supplies with h.f. Energy Conversion at a Constant Frequency.**

(Wysokosprawne układy zasilające z przetwarzaniem energii w.cz. o stałej częstotliwości pracy).

Jan Ebert, Prof., D.Sc.,

M. Mikołajewski, J. Modzelewski, A. Owczarek, A. Wajs
25.05.98-30.04.99.

The purpose of the project was an analysis and optimisation of novel synchronous regulators (single and double-switch) that can be used to control output power in h.f. resonant dc/dc converters operating at a constant frequency. The new circuits were optimised to minimise power losses in their components. Two laboratory models of resonant dc/dc converters with synchronous regulators and a Class E amplifier were built and tested. The converters operated at a constant frequency $f=1\text{MHz}$ delivering output power $100\text{W}/V_o=12\text{V}$ and $50\text{W}/V_o=5\text{V}$ in the circuit with a single-switch and double-switch regulator.

[Pro4] **Methods of Analysis and Design of the TV Circuits and Systems** (Metody analizy i

projektowania układów i systemów telewizyjnych).

Józef Modelski, Prof., D.Sc.,

W. Skarbak, A. Buchowicz, Z. Kozłowski, K. Ignasiak, J. Kondarewicz, J. Marzyjanek, M. Olszowy, T. Smakuszewski, K. Wnukowicz, K. Ebert, E. Snitkowska
25.05.98-30.04.99.

New methodology for pattern recognition is presented which is based on design of invariant reference points. It is shown that the k-NN distance classifier and the neural subspace method are special cases of this methodology. New classifiers within this framework are also described.

[Pro5] **Analog and Digital Sound Processing Systems.** (Analogowe i cyfrowe systemy obróbki dźwięku).

Zbigniew Kulka, Ph.D.,

A. Leszczyński, M. Tajchert, P. Nykiel, A. Aronowski, K. Rudnicki
25.05.98-30.04.99.

- Elaboration of the new sound studio concept, based on two control rooms, the first one for professional sound recording and processing, the second one for student's training purposes.
- Acoustic adaptation of the student's control room as well as installation and testing of the multitrack DM 800 and TripleDat systems, allowing analog and digital sound recording.
- Elaboration of PC based sound and picture synchronization system.
- Elaboration of the DSP system for the simulation of the acoustic field in the room.
- Elaboration of the research stations based on PC computers, for design, analysis, and optimisation of digital audio filters. One station is predestined for filtering structures working with constant sampling frequency, second for sample rate conversion structures. The features of few designed digital filters have been presented.

[Pro6] **Development of the Institute's Computer Network.** (Modernizacja sieci komputerowej IR PW).

Wiesław Winiecki, Ph.D.,

A. Owczarek, A. Sielski, M. Sypniewski, A. Więckowski
25.05.98-30.04.99.

The state of the Institute's computer network was analysed. Possibilities of modification the network were considered. A new, structural computer network in the Institute was designed and realised. A new equipment was built. The network was connected with the Faculty's network.

[Pro7] **Radiation Techniques in Medicine.** (Metody radiacyjne w technikach medycznych).

Zdzisław Pawłowski, Prof., D.Sc.,

M. Kazubek, R. Szabatin, P. Bogorodzki, P. Brzeski, D. Ćwiek, L. Padee, G. Domański, T. Jamrógiewicz, J. Marzec, B. Konarzewski, J. Mirkowski, T. Olszewski, E. Piątkowska-Janko, A. Piątkowski, A. Przelaskowski, W. Smolik, J. Wasilewski, A. Wasilewski, K. Zaremba
25.05.98-30.04.99.

The research work are concentrated on four subjects:

a) *The analysis of properties of radiographic imaging systems equipped with scintillating sensors.*

The influence of fluctuation processes on image quality in radiographic imaging sensors equipped with scintillating sensors and the matrix of silicon diodes was investigated. The models of X-ray to light conversion, light transmission and light to electric signal conversion processes were developed. The equations which relates these processes and the S/N factor were formulated.

b) *Automated measurement and correction of gradient magnetic field rise-time for bruker BMT1000 magnetic resonance tomograph using RS485 interface.*

A digital integrator for switching magnetic measurements has been designed and constructed. The analogue signal induced in a sensing coil is converted to digital processing by PC. By means of appropriate algorithms base line distortion resulting from offset in measuring circuit is restored. The signal is further process in order to compute time constants and to apply appropriate correction preemphasis. Data in the system are transmitted over home-built LAN based on RS485.

c) *X-ray stereopresentation*

The possibility of determining the parameters of rotation of bones in 3D space was investigated. For this purpose the two orthogonal projections from rtg and CT tomogram derived from pre operative examination were used. Based on 60 projections 9 spaced 3 degree of real bone the best function which maps the distance between this projections in a function of the rotation angle was searched. The main idea was to determine a set of the best features extracted by suitable transformations of the images. The results show that the best transformation is determined by the profile of the images, which are orthogonal to this axis of bone symmetry.

d) *Research workstation for medical image processing*

Communication software for medical images transmission in DICOM standard has been elaborated. Libraries with medical images reading procedures in DICOM standard as well as with decoding procedures of various ACR-NEMA formats of image data have been created. Additionally, the programme DICOM viewer has been worked-out for image visualisation.

[Pro8] **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. Podgórski, A. Miękina, T. Szafranski
25.05.98 - 30.04.99.

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 analysis of accuracy of those algorithms, and to the upgrading of the research infrastructure. A new systematic approach to the classification and analysis of the algorithms of interval-algebra-based procedures for the accuracy analysis of

weakly nonlinear algorithms have been designed, implemented and verified. A telemetric systems for civil construction monitoring, based on the network of fiber-optic sensors and previously developed algorithms of their calibration, has been also designed. The results were published in three conference papers.

- [Pro9] **Novel methods of computer measuring systems designing.** (Nowoczesne metody projektowania komputerowych systemów pomiarowych).
Wiesław Winięcki, Ph.D.,
 K. Adamowicz, P. Bobiński, R. Leoniak,
 P. Łukaszewski
 25.05.98 - 30.04.99.

Available tools for putting measuring systems in service were analysed. A new simulator / analyser of IEC - 625/SCPI measuring systems was designed. Influence of new CAD tools, named integrated software environment (ISE), for measuring systems designing was analysed. A new model of virtual instruments, used in measuring systems designing with ISE, was proposed. Systematic arrangement of source information on designing of instrument software drivers was described. A methodology for new VISA type instrument drivers design using ISE was proposed.

Projects granted by the Rector

- [Pro10] **Measurement Methods of Pulsed Microwave Circuits.** (Metody pomiaru parametrów mikrofalowych układów aktywnych pracujących impulsowo).
Tadeusz Morawski, Prof.,D.Sc.,
 W. Wojtasiak, J. Zborowska, D. Gryglewski,
 R. Michnowski, M. Kukier
 21.05.98 -31.05.99.

The measurement methods of the transmittance changes of the microwave two-ports have been elaborated. The accuracy of the transmittance measurement during the power pulse was 0.05 dB for magnitude and 0.1° for phase.

- [Pro11] **Application of Wavelet Transform for Transient Power and Frequency Evaluation in Radiocommunication Transmitters.** (Wykorzystanie transformacji falkowej do oceny zmian mocy i częstotliwości nadajników radiokomunikacyjnych w stanach przejściowych).
Adam Fiok, Prof.,D.Sc.,
 J. Kołakowski
 21.05.98 -31.05.99.

The project deals with an application of digital signal processing to measurements of transients in radiocommunication transmitters. Investigations proved that wavelet transform is an effective tool for investigation of transient power and frequency. Software implementation of the proposed method is relatively simple, measurement arrangement used for signal acquisition is cost-effective. The project resulted in software supporting investigation of transmitter transients. Application allows for: transmitter signal acquisition, calculation of time-frequency representation of the signal, determination of transient frequency using spectrogram ridges.

- [Pro12] **Effective Methods of Data Compression.** (Efektywne metody kompresji danych).
Artur Przelaskowski, Ph.D.,
 21.05.98 -31.05.99.

Two main topics of the research could be distinguished: entire version of data compression book and development of wavelet-based coder. The most popular and effective methods of data compression are considered in 15 chapters of 250 pages book presented temporarily in the Internet. Lossless image compression with linear prediction models, image quality measures, scalar and vector quantization and subband coding are presented more carefully in this book. Wavelets for image compression, as another part of the research, by means of mostly optimal filter bank estimation, quantization scheme with data thresholding and scalar uniform algorithm and coding scheme with significant nodes at modified zerotree structures. Further investigations are due to lossless image coder with complex statistical modelling and new scalar and vector quality measures correlated to psychovisual evaluation and subjective interpretation.

- [Pro13] **Conceptual and Design Analysis of the Digital Acquisition, Reconstruction and Hardware Compression Methods for Video Signals.** (Analiza układów cyfrowego przetwarzania i kompresji sygnałów wizyjnych w systemach komputerowych oraz realizacja komputerowej karty akwizycji sygnałów wizyjnych).
Józef Modelski, Prof.,D.Sc.,
 K. Mroczek, J. Kondarewicz
 21.05.98 -31.05.99.

This dissertation deals with conceptual and design analysis of the digital acquisition, reconstruction and hardware compression methods for video signals. The real time applications were analysed, where hardware ASIC and DSP solutions are required. The work also includes considerations various aspects of using programmable FPGA and CPLD chips for hardware pre-processing and compression systems (M-JPEG, MPEG) for video signals. Besides provides a project of video signals plug-in frame grabber card for PC computers.

- [Pro14] **Indoor Propagation Prediction in the Frequency Range 2GHz.** (Metody prognozowania propagacji fal radiowych zakresu 2GHz w warunkach wielkomiejskich).
Tomasz Kosił, Ph.D.,
 F. Alwafi, D. Janusek, K. Kurek
 21.05.98 - 31.05.99.

The importance of short distance radiocommunication systems for indoor applications is growing fast now, mainly in the frequency range 1.8 – 2.4 GHz (DCS, DECT, ISM, WLAN-IEEE 802.11, UMTS). This study is concerned with the propagation analysis for that type of systems. This work is intended to be the first step to build propagation prediction system: software and hardware. In the frame of this project the theoretical study, the first version of a propagation tool and propagation measurements inside Faculty building were made.

- [Pro15] **X and Gamma Ray Spectrometry for the Bone Composition Determination.** (Spektrometria promieniowania X i gamma w badaniach tkanek kostnych).

Krzysztof Zaremba, Ph.D.,

21.05.98 -31.05.99

The project deals with the non-invasive method of measurement of heavy elements concentrations in bones. X-Ray Fluorescence Analysis (XRFA) is a precise spectrometric method which allows rapid and simultaneous determination of major elements content in various materials. The method has been successfully applied in medicine for in-vitro measurement of biological specimens composition as well as for in-vivo determination of metals (Pb, Hg, Cd etc.) and some bioelements concentration in bones and soft tissue. Two methods of the heavy metals concentration in the bone were proposed. The mathematical model of the physical processes accompanying the radiation transmission through the sample was proposed. The model was used for the determination of the optimum measurement conditions as well as for the accuracy analysis. The series of measurements of the phantoms were carried out. Both methods were also used for examination of two groups of patients. The results proved very good sensitivity and accuracy of the XRFA technique.

[Pro16] **Method for measurement of timing jitter in the clocks used for D/A converters in CD,MD and DVD players** (Opracowanie koncepcji pomiaru fluktuacji okresu próbkowania (jittera) sygnałów zegarowych przetworników cyfrowo-analogowych stosowanych w odtwarzaczach CD, MD i DVD).

Zbigniew Kulka, D.Sc.,

R. Zawadzki

21.05.98 -30.09.99.

In the first part of the work an influence of timing variations (jitter) in the clocks that serve as the time-base reference in digital audio systems on sonic degradation is briefly analysed. The attention was focused on interface jitter, which if not effectively reduced increases sampling clock jitter of D/A converters used in CD, MD and DVD players. As a result the quality of reproduced sound decreases. In second part of the work the designed jitter meter/reductor instrument for S/PDIF digital audio interface is presented.

Projects granted by the Dean

[Pro17] **The Multimode Method for Measurements of Material Parameters at Microwave Frequencies.** (Wielorodzajowa metoda pomiaru parametrów materiałów na częstotliwościach mikrofalowych).

Krzysztof Derzakowski, Ph.D.,

A. Abramowicz, J. Krupka, J. Modelski

1.07.98 - 31.05.99.

The work results in theoretical basis for a new multimode method of complex permittivity measurements at microwave frequencies. Optimal structure parameters, set of used resonant modes as well as the measuring procedure 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.

[Pro18] **Virtual Laboratory Accessible via Internet** (Wirtualne laboratorium w Internecie).

Władysław Skarbek, Prof.,D.Sc.,

P. Bobiński, A. Buchowicz, G. Galiński, K. Ignasiak, T. Jamrógiewicz, 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

1.07.98 - 31.05.99.

The goal of this research is the development a Virtual Laboratory at our Faculty, i.e. an information system devoted for remote access through Internet to chosen lab devices and unique computational services. In the first year the following tasks have been implemented:

- *Developing of coherent multimedia data compression algorithms:* application of neural MOR algorithm for multimedia data compression analysis of correctness for MOR algorithm MOR application of MOR algorithm for approximation of 2D KLT transform and for image compression analysis for net models of fractal coder developing of methodology for intelligent interfacing to multimedia data giving traffic reduction in the network analysis for compression of audio data.
- *Implementation of transmission system for multimedia objects (video, audio) and measurement data:* simple HTTP server, simple video server with remote camera control; audio server for dialog groups in Internet, text communication system for dialog groups; implementation methodology for measurement data transmission from remote devices with RS232 interface, IEC-625, APiB, and USB; remote starting of Java services.
- *Design and implementation of remote access to chosen systems:* virtual devices (paper for XXXI MKM); research of TV channel; electromagnetic spectrum analyser; electroacoustic research; monitoring of parameters for remote rooms; image based telemedicine system; data acquisition card DAQ.

[Pro19] **The Optimisation of Scintillating Imaging Sensors for Digital Radiography.**

(Optymalizacja scyntylicyjnych sensorów obrazów do radiografii cyfrowej).

Zdzisław Pawłowski, Prof.,D.Sc.,

B. Konarzewski, J. Marzec, K. Zaremba, G. Domański

1.07.98 - 31.05.99.

In digital radiography the quality of imaging systems is determined by an image sensor (detector). The research purpose is to find such sensors that assure the best image quality with minimum patient risk - minimum radiation dose. This work presents the generalised model of the fluctuation processes which influence detective quantum efficiency (*DQE*) of radiographic imaging sensors. The model enables calculation of energy and sensor geometric parameters. It describes dependence of the *DQE* on the distribution of absorbed energy, X-ray to light conversion fluctuations and high absorption and scattering. The X-ray absorbed energy distribution was simulated by Monte Carlo method. The light propagation influence the *DQE* was determined by the *DQE* dependence on

the kind of scintillator, radiation solution of the light diffusion equation. This model was applied for optimum selection of the kind of scintillator and its parameters for digital X-ray densitometry.

[Pro20] **Design Techniques on the Piecewise Ellipsoidal Approximation to the Constraint Region.** (Projektowanie układów w oparciu o elipsoidalną aproksymację obszaru ograniczeń).

Jacek Wojciechowski, Prof., D.Sc.,
1.07.98 - 31.05.99.

Design techniques based on the piecewise ellipsoidal approximation to the constraint region. Application of the piecewise ellipsoidal approximation (PEA) to the constraint region was extended to cover nonlinear systems. Two sets of system variables were distinguished: independent technological parameters, and dependable design variables. The former are used for constructing approximation to the constraint region, the latter are exploited in various optimal design scenarios.

The following algorithms for optimal design were developed and checked:

- design centering,
- worst case design,
- yield vs. cost optimization.

either as entirely new algorithms or as creative adaptation, exploiting properties of the PEA, for the existing general algorithms.

[Pro21] **Microwave Subsystems for Radiolocation and Flying Objects Control.** (Mikrofalowe podzespoły systemów radiolokacyjnych i systemów sterowania obiektami).

Tadeusz Morawski, Prof., D.Sc.,
S. Rosłonec, W. Wojtasiak, J. Zborowska,
D. Gryglewski, R. Michnowski, M. Kukier
1.07.98 - 31.05.99.

The aims of the research investigations were the elaborations of the designing methods of chosen microwave subsystems for radiolocation and flying objects control. Works were concentrated on designing methods of such circuits as high-stable sources of microwave signals (synthesizers), high-power noise sources and high-linear amplitude modulators. The elaborated methods were used to design several models of subsystems, such as X-band synthesizer, S-band and C-band noise sources and L-band amplitude modulator. The constructed models were experimentally measured and good electrical results were obtained.

[Pro22] **The Synthesis and Optimization of Cellular Base Station Antenna Radiation Pattern.** (Synteza i optymalizacja charakterystyki promieniowania anten stacji bazowych telefonii komórkowej).

Jacek Jarkowski, Ph.D.,
H. Chaciński
1.07.98 - 31.05.99.

The method of magnitude-phase synthesis was applied to the typical cellular base station antennas. The problem of radiation pattern optimization of such antenna is considered. The main aim of the problem is to minimize the field level down the base antenna where people may work and live. For the specific neighbourhood of the base configuration of the field can

be described with safety zones. Then, the desirable radiation pattern can be evaluated. Applying the synthesis method the field distribution and radiation pattern can be optimized by finding the shape of the antenna and the current distribution in it. The process of optimization leads to the current distribution, which can be realized by means of fulfilling pattern conditions like shape and side lobes levels. The same examples of the synthesis and optimization process for typical field distribution are presented.

[Pro23] **The Red Shift Effect in the Bellert Theory.** (Efekt przesunięcia ku podczerwieni na gruncie teorii Bellerta).

Stefan Hahn, Prof., D.Sc.,
J. Jarkowski
1.07.98 - 31.05.99.

According to the recent discoveries made by repaired Hubble Space Telescope scientist discuss new clues concerning the redshift effect, value of the Hubble constant and the problem of the Universe age. These discoveries can be applied to the theory and hypothesis of propagation properties. The question is: Does the electromagnetic wave travelling in space change its frequency? Some important explanation is given by Bellert in his theory.

Priority grants

[Pro24] **Applied Combinatorics and Discrete Optimisation** (Zastosowania kombinatoryki i optymalizacja dyskretna w zagadnieniach sieciowych).

Jacek Wojciechowski, Prof., D.Sc.,
18.06.98-31.05.99.

The project was aimed at the optimal design, operation and scheduling of networks. The techniques used are as follows: combinatorics, graph theory, discrete optimisation (e.g. evolutionary and k-optimal algorithms, simulating annealing). The specific tasks were: design of graphs with optimally reliable structures, design of robust telecommunication networks, optimal scheduling, design of microwave circuits with the use of evolutionary algorithms.

[Pro25] **Application of Genetic Algorithms in Bayes Reconstruction of Images from Projection in Emission Tomography.** (Zastosowanie algorytmów genetycznych w bayesowskiej rekonstrukcji obrazów z projekcji w tomografii emisyjnej).

Waldemar Smolik, Ph.D.,
D. Ćwiek
22.06.98 - 31.05.99.

The distribution and flow of radioactive tracer in the human body is imaged in the emission tomography. One of the more important factors limiting image quality in emission tomography is the statistical nature of radioactive emission. The statistical algorithms take into consideration the statistical nature of radiation emission, by respecting the probability density function for measured projections. In this work, the example of genetic algorithm for statistical image reconstruction was elaborated. The genetic algorithm was based on the typical genetic scheme modified due to the nature of solved problem. The convergence of iterative algorithm was examined. The different adaptation functions,

selection and crossover methods were verified. The algorithm was tested on the simulated SPECT data. The obtained results of image reconstruction were discussed.

[Pro26] **Scanning system for bone density measurements** (Aparatura do skaningowych badań gęstości tkanek kostnych).
Zdzisław Pawłowski, Prof., D.Sc.,
A. Borecki, G. Domański, B. Konarzewski,
J. Marzec, K. Zaremba
22.06.98 - 31.05.99.

The methodology and equipment for X-ray laboratories for osteoporosis screening were developed. It was proved that inexpensive digital roentgen photodensitometry with application of rare earth intensifying screens and digital correction of image distortion is very useful in osteoporosis screening. The scanning system with line, phosphor image detector for diagnosis of osteoporosis was constructed. It works with any diagnostic X-ray unit. The results of scanning system parameters measurements and example of bone density measurement were presented.

[Pro27] **Blood perfusion estimation with Power Doppler technique** (Estymacja ukrwienia z wykorzystaniem techniki Power Doppler).
Marian Kazubek, Ph.D.,
J. Mirkowski, A. Przelaskowski, T. Jamrógi-
wicz, L. Padee
22.06.98 - 31.05.99.

Abnormalities in tissue blood perfusion are a powerful tool in some types of cancer diagnosis. In this project a blood perfusion estimation method, with Power Doppler data is proposed. The basic method of the estimation of blood perfusion is a Power Doppler signal average power processing in operator defined volume unit. Acquired US signal data were taken simultaneously with 3D position data. Flow 3D distribution was calculated from standard US Power Doppler colour image and position data. By summarising, all measured pixel values in 3D grid a 3D distribution of average power spectra of Power Doppler signal is obtained. The project could be treated as a background for further medical applications.

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

[Pro28] **Simulation and Design of Switched Power Converters.** (Symulacja i projektowanie sterowanych przełączników mocy).
Jacek Wojciechowski, Prof., D.Sc.,
A. Filipkowski, J. Ogrodzki, M. Bukowski
L. Opalski, K. Zamłyński
30.07.96-31.07.99.

- Development of methodology and techniques of analysis and computer aided design of switched circuits (e.g. power converters),
- Computer implementation and verification of the proposed technique,
- Research on the following topics:
 - models of components of switched circuits,
 - simulation of switched circuits using models of different levels of accuracy (e.g. ideal switches versus full models of switches),

- fast steady state,
- methodology of design of switched circuits.

[Pro29] **Secure Short-range Radio Data Transmission.** (Bezpieczna radiowa transmisja danych o zasięgu lokalnym).
Tomasz Buczkowski, Ph.D.,
K. Czerwiński, T. Kosiło, D. Janusek
22.09.97 - 31.12.99.

- Development and verification of mathematical model of radio propagation in specified frequency range in the vicinity and inside buildings.
- Analysis and practical verification of electromagnetic compatibility of the system.
- Development and verification of data transmission protocol, method of data encoding and signal modulation ensuring error-free transmission protected against unauthorized access.

[Pro30] **Algorithms for Improving Metrological Characteristics of Instrumentation Applied in Environmental Monitoring.** (Algorytmy poprawiania charakterystyk metrologicznych aparatury stosowanej w monitoringu środowiska naturalnego).
Roman Z. Morawski, Prof., D.Sc.,
M. Chudy, P. Kluk, A. Miękina, G. Misiurski,
C. Niedziński, A. Podgórski, P. Sprzęczak,
T. Szafrąński, N. Lien Huong, A. Witan
8.07.96 - 30.06.99.

The objectives of the project are used as follows:

- Development of new algorithms for calibration of measurement channels and for measurand reconstruction, based on:
 - constrained optimisation making possible full utilization of available *a priori* information on the measurand, measurement channel and measurement errors,
 - nonlinear models of measurement data,
 - criteria for evaluation of the quality of measurement reconstruction, related to measurement goals.
- Design of software for processing spectrometric data used in environmental monitoring.
- Design of software for processing data acquired by means of the sensors of quantities important for environmental monitoring.
- Reduction of the costs of instrumentation, so as to make possible its *in situ* application.

[Pro31] **Improvement, Analysis and Modelling of Class-D High-frequency Tuned Power Amplifiers.** (Doskonalenie, analiza i modelowanie rezonansowych wzmacniaczy mocy wielkiej częstotliwości klasy D).
Juliusz Modzelewski, Ph.D.,
J. Ebert, M. Mikołajewski, A. Owczarek,
K. Puczko, A. Wajs
01.06.98 - 31.10.99.

The main factors limiting the performance of conventional Class-D tuned power amplifiers are switching losses and switching noise. These factors can be reduced in the improved Class-D amplifier (called the Class-Du Zero-Voltage-Switching (ZVS) amplifier in which the soft-switching technique is used. The optimum and suboptimum operations of the Class-Du

ZVS amplifier are analysed and the experimental power amplifiers are built and tested.

[Pro32] **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.,
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 machines.

[Pro33] **MRI of Heart and Large Vessels - imaging Sequence Optimalization.**

(Analiza metod obrazowania MR dla uzyskania optymalnej rozdzielczości kontrastowej w badaniach serca i dużych naczyń).

Piotr Bogorodzki, M.Sc.,

A. Piątkowski, E. Piątkowska-Janko, J. Wasielewski.
01.11.96 - 30.04.99.

Optimization of imaging sequence in order to obtain contrast resolution for cardiac and vessel imaging.

[Pro34] **Methods and Instrumentation for the Simultaneous Registration and Processing of Ventricular and Atrial Late Potentials**

(Metody i urządzenia do jednoczesnej rejestracji przetwarzania i analizy potencjałów przedsionkowych i komorowych z jednoczesnym wspomaganie diagnozy).

Adam Piątkowski, Prof. D.Sc.,

E. Piątkowska-Janko, P. Bogorodzki, J. Wasielewski, G. Opolski
1.03.97-31.08.99.

- Basic concept of the simultaneous registration of ventricular and atrial late potentials,
- Development of new equipment for simultaneous registration of high-resolution ECG ventricular and atrial late potentials,
- Analysis of an optimum number of parameters for late potentials vector which gives a higher percentage of correct decisions and a good separation of patients from different group,
- Suggestion of mathematical analysis for diagnosis support.

4.3. Other projects

[Pro35] **Development of Remotely Controlled Radiomonitoring Site** (Konceptcja i

realizacja zdalnego sterowania pracą stanowiska radiomonitoringowego).

Jacek Cichocki, Ph.D.,

J. Kołakowski, K. Radecki
24.10.97-28.04.99.

Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR).

- Determination of equipment to be used at radiomonitoring site, evaluation of equipment metrological features,
- Development of software controlling instruments used at radiocommunication site,
- Development of software for radiocommunication site control.

[Pro36] **A Measuring System for Carrier Frequency Offset Measurement of Radio and TV Transmitters**

(Konceptcja i realizacja badania odchyłek częstotliwości nadajników UKF/TV i stabilności aparatury pomiarowej).

Wiesław Winiecki, Ph.D.,

R. Leoniak, P. Łukaszewski, P. Bobiński
1.05.98 - 31.01.99.

Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR)

A system for measuring, processing and storing carrier frequency offsets of radio and TV transmitters has been designed. A measurement of the frequency is based on passing of transmitter's frequency error into intermediate frequency of a receiver. The results of carrier frequency measurements and their qualification (the margin of carrier offset passed or not) are presented on PC screen or printed. The program enables one to present these data on-line or off-line using a specialised database programme.

[Pro37] **COMPASS Experiment - Design of Apparatus and Software Development.**

(Eksperyment COMPASS - budowa aparatury i przygotowanie oprogramowania, II etap).

Krzysztof Zaremba, Ph.D.,

Z. Pawłowski, J. Marzec, B. Konarzewski, G. Domański
1.08.98 - 30.06.99.

Fund by KBN

- Design of a read-out system for gaseous detectors which will be used in the COMPASS experiment at CERN.
- Application of the results of the project in the international high energy physics experiment COMPASS at CERN.

[Pro38] **Development of GigaAnritsu Radiomonitoring System** (Analiza możliwości funkcjonalnego rozwoju systemu GigaAnritsu).

Winiecki .Wiesław, Ph.D.,

P. Bobiński, R. Leoniak, R. Łukaszewski
1.03-15.12.99.

Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR).

- Development of algorithms for automatic determination of GigaAnritsu system stability;
- Design of software for processing data acquired by the system;

- Research on remote controlling and servicing the system.

[Pro39] **Design and optimization of electronic circuit for level-dependent ear-muffs.**

(Badania i optymalizacja układu elektronicznego do nauszników przeciw-hałasowych z regulowanym tłumikiem).

Zbigniew Kulka, Ph. D.,

E. Kotarbińska, M. Siek, A. Aronowski

4.05-30.09.99

Fund by Central Institute for Labour Protection.

The project was aimed at the optimal design of battery supplied electronic circuit (including microphone, gain controlled nonlinear amplifier and loudspeaker) for level-dependent ear-muffs (i.e. ear-muffs with electronic sound restoration circuit). A number of prototype circuits were investigated and tested to obtain the best compromise between required electrical performance, low power consumption and low cost. Finally, the optimal circuit which fulfilled the hearing protection requirements has been developed.

[Pro40] **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.,

2.01.99-15.12.2000.

Found by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej 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.

[Pro41] **System requirements for GSM-R at CMK railway line 200-250 km/h** (Wymagania systemowe na system GSM-R dla linii CMK (200/250 km/h).

Józef Modelski, Prof., D.Sc.,

T. Kosiło, T. Krzymień

April, 1999.

Found by National Railways Scientific and Technical Center (PKP-Centrum Naukowo-Techniczne Kolejnictwa).

In Europe the new GSM-R radiocommunication system for railways is introduced. The standards of that system are normalised by ETSI and UTC (project EIRENE). The main objective of the work was to study the introduction of that standard at Polish Railways and to define the system and functional requirements for GSM-R applications in Poland.

[Pro42] **Development of the Software Supporting Operation of Radiomonitoring System** (Koncepcja i realizacja oprogramowania wspomagającego pracę systemu radiomonitoringowego).

Jacek Cichocki, Ph.D.,

J. Kołakowski, D. Grabowski, S. Maszczyk

12.03-29.11.99.

Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR).

- Development of the new extended version of software supporting operation of radiomonitoring system DFS-8;
- Development of procedures for scanning previously programmed frequency bands; after detection of the signal the direction finding procedures are triggered and location of signal source is determined;
- Enhancement of result presentation procedures; location of signal source is presented on the digital map.

[Pro43] **A Concept of Software Supporting Implementation of Mobile Direction Finding Stations in Radiomonitoring System** (Koncepcja oprogramowania umożliwiającego wykorzystanie ruchomych stacji namiarowych w systemie radiomonitoringu).

Jacek Cichocki, Ph.D.,

J. Kołakowski, D. Grabowski, S. Maszczyk

22.03-27.10.99.

Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR).

- Investigation of properties of mobile direction finding (DF) station in urban environment; experiments were made with the operational model of DF station consisting of DF instruments mounted in a truck;
- Design of the concept of software supporting implementation of mobile DF stations in DFS-8 radiomonitoring system.

[Pro44] **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 duplekserów mikrofalowych do radiolinii oraz wykonanie przestrojenia 100 sztuk urządzeń)

Krzysztof Derzakowski, Ph. D.

J. Modelski, K. Kurek

30.12.98-28.02.99

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.

[Pro45] **Design Method of Modernization and Modernization of Five Specialized Units)** (Opracowanie metodyki modernizacji i przeprowadzenie modernizacji pięciu zespołów)

Krzysztof Kowalski, Ph.D.,

27.05-30.10.99

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

The five specialised units have been designed and constructed.

- [Pro46] **The Prototype of Integrated Digital Monitoring System Using MPEG Standard**
 (Prototyp zintegrowanego systemu cyfrowego monitoringu telewizyjnego z użyciem kodowania wideo MIE G1).
Władysław Skarbek, Prof., D.Sc.,
 1.06-30.08.99.
 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.

- [Pro47] **Clinical Software NMS and Gammacamera Interface for Siemens ZLC 750 Stand**
 (Oprogramowanie kliniczne NMS (nowa wersja) pod WIN'95 + interfejs do Gamma kamery Siemens).
Roman Szabatin, Ph.D.,
 5 Wojskowy Szpital Kliniczny z Polikliniką
 SP ZOZ Kraków
 1.11.99

The two diagnostic programmes have been elaborated for dynamic kidney study and for dynamic liver study. The solution of the "Y2K problem" for NMS system has been solved too.

- [Pro48] **Design and Construction of Noise Sources for L-band and S-band**
 (Wykonanie podzespołów: źródło szumów na pasmo L; źródło szumów na pasmo S).
Wojciech Wojtasiak, Ph.D.,
 10.12.98-30.06.99.

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

A series of microwave noise sources (L and S frequency bands) for applications in military radar

systems have been designed, constructed and implemented in practical radar systems.

- [Pro49] **Design and Construction of Broad-Band Noise Source** (Opracowanie i wykonanie szerokopasmowego źródła szumowego).
Wojciech Wojtasiak, Ph.D.,
 1.09-15.12.99.

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

The broad-band microwave noise source for applications in military radar system has been designed and constructed.

- [Pro50] **Electronic aid orientation system for blind people in urban environment**
 (Elektroniczny system wspomagania orientacji terenowej w środowisku miejskim dla osób niewidomych).
 K. Radecki, T. Buczkowski, W. Kazubski
 2.11.98 – 25.11.99

Joint project of Institute of Biocybernetics and Biomedical Engineering Polish Academy of Science, Institute of Radioelectronics and industrial client (Emtron)

- Development of electronic aid orientation system for blind people based on RF micro-transmitters and individual receivers in order to mark characteristic places in urban environment
- Testing of the system in urban environment and various weather conditions
- Implementation of the system to serialized production and training within industry
- Lectures and laboratory practise for students on designing and exploitation of electronic aid orientation systems for blind people.

5. DEGREES AWARDED

5.1. Ph.D. Degrees

- [PhD1] Krystian Ignasiak: „Rozpoznawanie obiektów metodą inwariantnych punktów referencyjnych” (Object recognition using invariant reference points methodology), Prof. **W. Skarbek** (tutor), Warsaw 1999.
- [PhD2] Andrzej Kozak: „Optymalizacja pasywnych struktur mikrofalowych o dowolnych kształtach z wykorzystaniem trójwymiarowego modelowania elektromagnetycznego” (Optimization of arbitrarily shaped passive microwave structures using three-dimensional electromagnetic modeling), Prof. **W. Gwarek** (tutor), Warsaw 1999.
- [PhD3] Błażej Sawionek: „Synteza struktury sieci odpornej na uszkodzenia krawędzi” (Synthesis of reliable networks in the presence of link failures), Prof. **J. Wojciechowski** (tutor), Warsaw 1999.

5.2. M.Sc. Degrees

- [MSc1] Janusz Bielak: „Wpływ zastosowania anteny kierunkowej w terminalach jako przybliżonego modelu anteny adaptatywnej na parametry systemu radiowej pętli abonenckiej WILL[®]CDMA” (Influence of utilization of directional antenna as a simple adaptive antenna model in subscriber units on parameters of the wireless local loop WILL[®]CDMA system), Assist. Prof. **T. Kosiło** (tutor), (4,5).
- [MSc2] Tomasz Cąderek: „Terminal odczytowy dla systemu do zbierania wskazań liczników energii elektrycznej drogą radiową” (Read-out terminal for electric meter reading system using the radio-link), Assist. Prof. **T. Buczkowski** (tutor), (5).
- [MSc3] Agnieszka Ceryngier: „Warstwy monokrystalicznego diamentu na potrzeby pokryć dla implantów medycznych” (Monocrystallic diament layers with the purpose for medical implant covering), Prof. **J. Szmidt** (tutor), (4).
- [MSc4] Paweł Chęć: „Warunki odsłuchowe w reżyserni” (Listening conditions in a control room), Assist. Prof. **M. Tajchert** (tutor), (4).
- [MSc5] Jacek Dobrzyński: „Algorytmy wyznaczania przestrzennej charakterystyki promieniowania szyku antenowego w oparciu o rozkład pola elektromagnetycznego w strefie bliskiej” (An algorithm for determination of far-field antenna patterns from electromagnetic field measured in near-field zone), Prof. **S. Rosłońiec** (tutor), (4,5).

- [MSc6] Piotr Dyderski: „Algorytmy projektowania mikrofalowych filtrów pasmowo-zaporowych realizowanych w postaci niewspółmiernych torów schodkowych” (Algorithms for computer-aided design of noncommensurate transmission line microwave bandstop filters), Prof. **S. Rosłońiec** (tutor), (5).
- [MSc7] Jacek Frey: „Stanowisko testowe dla układu ASD 8” (Testing device for ASD 8 chip) Assist. Prof. **J. Marzec** (tutor), (5).
- [MSc8] Jakub Galczak: „Organizacja, archiwizacja i wymiana obrazowych danych medycznych w standardzie DICOM” (Organization, archiving and exchange of medical image data in DICOM standard), Assist. Prof. **P. Brzeski** (tutor), (5).
- [MSc9] Artur Gałat: „Modułowy system zbierania danych telemetrycznych przeznaczonych dla małych systemów satelitarnych” (The modular system of an acquiring of telemetric data for small satellites) Assist. Prof. **K. Derzakowski** (tutor), (4,5).
- [MSc10] Jarosław Gawryszewski: „Właściwości propagacyjne fal radiowych w zakresie 2000 MHz dla ośrodka zurbanizowanego i otwartego przy określonych wartościach odległości między nadajnikiem a odbiornikiem, z uwzględnieniem zastosowania różnych modeli tłumienności trasy (typu punkt - punkt) w systemach komórkowych” (Propagation properties of radio-waves in the range of 200 MHz for the urbanic and open medium in certain distances between transmitter and emitter taking into account various models of route loss: point-point type in cellural systems) Assist. Prof. **J. Jarkowski**, (tutor), (5).
- [MSc11] Grzegorz Goluch: „Konwersja przemysłowych formatów danych, projektowanie układów mikrofalowych dla celów symulacji elektromagnetycznej” (Industry data formats conversion, designing of microwave systems for the purpose of electromagnetic stimulation), Assist. Prof. **M. Sypniewski**, (tutor), (4).
- [MSc12] Piotr Gontarek: „Opracowanie modelu układu elektronicznego nauszniaka przeciwhałasowego z regulowanym tłumieniem” (Project of electronic circuit for use the level-dependent ear-muffs), Assist. Prof. **E. Kortarbińska** (tutor), (5).
- [MSc13] Mariusz Grześkiewicz: „Poszukiwanie algorytmu decyzyjnego w zadaniu klasyfikacji chorych z napadowym migotaniem przedsionków” (Finding an algorithm for discrimination patients with sVT), Assist. Prof. **K. Zaremba** (tutor), (5).
- [MSc14] Robert Gutkowski: „Badanie wpływu telefonów komórkowych systemu GSM na

- aparaturę kardiologiczną*” (Testing of the influence of cellular phones working in GSM system on cardiological devices), Assist. Prof. **T. Buczkowski** (tutor), (4).
- [MSc15] Arkadiusz Kantorski: *„Badanie właściwości akustycznych dźwiękoizolacyjnych kabin przemysłowych z uwzględnieniem zakresu niskich częstotliwości”* (Research on the properties of industrial acoustic "refuges" (soundproof cabins) including the bandwidth for low frequency noise), Assist. Prof. **E. Kortańska** (tutor), (5).
- [MSc16] Tomasz Keller: *„System do pomiaru zniekształceń intermodulacyjnych w sieciach telewizji kablowej”* (System for the measurements of the second and third order intermodulation distortion in CATV networks), Assist. Prof. **K. Derzakowski** (tutor), (5).
- [MSc17] Tomasz Kędziora: *„Symulacja systemów modulacji cyfrowych w środowisku signal processing work system”* (Simulation of digital modulation systems in signal processing work- system) Assist. Prof. **K. Radecki** (tutor), (5).
- [MSc18] Grzegorz Kielski: *„Model systemu do radiowego odczytu liczników energii elektrycznej”* (The model of radio-system for electric power meter reading)
Assist. Prof. **T. Buczkowski**, (tutor), (5).
- [MSc19] Marcin Kopeć: *„Kwantowe wydajności detekcji sensorów luminescencyjnych”* (Detection quantum efficiency of luminors sensors), Prof. **Z. Pawłowski** (tutor), (5).
- [MSc20] Mikołaj Maciejko: *„Pakiet cyfrowego przetwarzania sygnałów do komputera typu IBM PC”* (Digital signal processing card for IBM PC compatible computers) Assist. Prof. **A. Podgórski** (tutor), (5).
- [MSc21] Piotr Markiewicz: *„Impulsowany wzmacniacz mocy na pasmo C”* (Impulse power amplifier to C band), Assist. Prof. **W. Wojtasiak** (tutor), (5).
- [MSc22] Arkadiusz Masny: *„Cyfrowy układ modulacji/demulacji QPSK do laboratorium radiokomunikacji”* (Digital QPSK modulator/demodulator for radiocommunication laboratory), Assist. Prof. **K. Radecki** (tutor), (5).
- [MSc23] Adam Mazurek: *„Szerokopasmowy koder dźwięku MPEG/Audio”* (Wide-band encoder MPEG/Audio), Assist. Prof. **J. Jarkowski** (tutor), (4.5).
- [MSc24] Michał Mielniczuk: *„Struktury i dekodowanie obrazowych danych medycznych w standardzie DICOM”* (Structures and decoding of medical image data in DICOM standard), Assist. Prof. **P. Brzeski** (tutor), (5).
- [MSc25] Paweł Morawski: *„Aparat EKG do badań holterowskich z półprzewodnikową pamięcią danych”* (ECG Holter recorder with semiconductor memory data storage device), Assist. Prof. **K. Zaremba** (tutor), (5).
- [MSc26] Wojciech Padee: *„Bezinwazyjny pomiar napięcia na lampie rentgenowskiej metodą dwóch detektorów”* (A noninvasive method of X-tube high-voltage measurement by means of two detectors), Assist. Prof. **K. Zaremba** (tutor), (5).
- [MSc27] Piotr Panas: *„Przenośny cyfrowy kalibrator drgań wspomagany procesorem sygnałowym DSP 56167”* (Digital handheld calibrator exciter supported by DSP 56167), Assist. Prof. **A. Podgórski** (tutor), (5).
- [MSc28] Piotr Pasterski: *„Cyfrowa fotodensytometria rentgenowska do badań gęstości kości przedramienia”* (Digital radiological photodensitometry for studies on bone mineral density), Prof. **Z. Pawłowski** (tutor), (5).
- [MSc29] Karol Pawlak: *„Interpreter języka opisu struktur 3D dla potrzeb symulatora elektromagnetycznego”* (Interpreter of the language describing 3D structures for electromagnetic simulator) Assist. Prof. **A. Więckowski** (tutor), (5).
- [MSc30] Roman Pawłowicz: *„4-stanowy transmisyjny modulator fazy z liniami niejednorodnymi”* (Four-levels phase modulator-”switched non-uniform line” type), Assist. Prof. **W. Wojtasiak** (tutor), (5).
- [MSc31] Marcin Piasecki: *„Mikrofalowy wzmacniacz mocy sygnału szumu na pasmo C”* (High-power microwave amplifier designed for the noise signal to C band), Assist. Prof. **W. Wojtasiak** (tutor), (5).
- [MSc32] Jarosław Plichta: *„Algorytmy projektowania mikrofalowych filtrów pasmowoprzepustowych o szerokim, nieperiodycznym pasmie zaporowym”* (Algorithms for computer-aided design of bandpass microwave filters with wide nonperiodic insertion loss function), Prof. **S. Rosłonec** (tutor), (4.5).
- [MSc33] Ireneusz Puszkarski: *„Transmisja danych w sieciach kablowych”* (Data transmission on cable network), Prof. **J. Modelski** (tutor), (5).
- [MSc34] Piotr Semeniuk: *„Antena paskowa na podłożu dielektrycznym o promieniowaniu wzdłużnym”* (The grating antenna with bars on dielectric surface radiating along its axis) Assist. Prof. **J. Jarkowski** (tutor), (4).
- [MSc35] Piotr Spólny: *„Wirtualny woltmierz cyfrowy”* (Virtual DC voltmeter), Assist. Prof. **Adamowicz** (tutor), (5).
- [MSc36] Sebastian Stankiewicz: *„Badanie własności dźwięku emitowanego przez małe rozgłośnie radiowe w Polsce”* (The sound quality of

small radio-broadcasts in Poland), Assist. Prof. **M. Tajchert** (tutor), (5).

- [MSc37] Michał Szklanowski: „*Analiza niezawodności sieci*” (Network reliability analysis), Prof. **J. Wojciechowski** (tutor), (5).
- [MSc38] Elżbieta Tomaszuk: „*Badania homologacyjne stacji ruchomych GSM*” (GSM mobile stations homologation tests), Assist. Prof. **T. Buczkowski** (tutor), (5).
- [MSc39] Tomasz Wielgus: „*Usługi w systemie TETRA*” (Services at Tetra system), Prof. **M. Dąbrowski** (tutor), (4).
- [MSc40] Wioletta Wieszczycka: „*Studium do projektu polskiego, pełnozakresowego dedykowanego ośrodka terapii protonowej*” (Preliminary project of Polish dedicated proton therapy facility), Assist. Prof. **W. Scharf**, (5).
- [MSc41] Karol Wnukowicz: „*Bezstratne algorytmy kompresji obrazów*” (Lossless compression of images), Assist. Prof. **A. Buchowicz** (tutor), (5).
- [MSc42] Roman Woch: „*Doświadczalna weryfikacja uproszczonej metody analizy i projektowania rezonansowego wzmacniacza mocy*” (Experimental verification of simplified method for analysing and designing class D_U ZVS resonant power amplifier), Assist. Prof. **J. Modzelewski** (tutor), (5).
- [MSc43] Katarzyna Zacharska: „*Ogólne warunki propagacji dźwięku w morzach i oceanach - opracowanie modelu i programu komputerowego pozwalającego na dokładne wyznaczenie trajektorii promieni i natężenia pola akustycznego w Bałtyku*” (General conditions of sound propagation in seas and oceans - elaboration of the model and computer programme, allowing an exact appointing of rays trajectory and intensity of acoustic field in the Baltic sea), Assist. Prof. **J. Narkiewicz-Jodko** (tutor), (5).
- [MSc44] Piotr Zdunek: „*Transmisja cyfrowa w zakresie fal krótkich*” (Digital transmission in the range of short waves), Assist. Prof. **T. Kosito** (tutor), (5).
- [MSc45] Paweł Ziębakowski: „*Subiektywne metody oceny jakości obrazu telewizyjnego w systemach z kompresją*” (Methods of subjective assessment of compressed television pictures quality), Prof. **J. Modelski**, Assist. **T. Krzymień** (tutors), (5).
- [MSc46] Robert Żółtowski: „*Formaty dźwięku wielokanałowego*” (Multichannel sound formats), Assist. Prof. **J. Narkiewicz-Jodko** (tutor), (4).

5.3. B.Sc. Degrees

- [BSc1] Radosław Biernacki: „*Oprogramowanie wspomagające pomiary nadajników TDMA z wykorzystaniem analizatora widma*” (Software supporting measurements of TDMA transmitters with the use of spectrum analyser), Assist. **J. Kołakowski** (tutor), (4.5).
- [BSc2] Tomasz Gontarek: „*Projekt radiokomunikacyjnego systemu pomiarowo-kontrolnego przy użyciu zintegrowanego środowiska LabWindows/CVI*” (Design of radio-communication measurement control system using integrated environment LabWindows/CVI), Assist. Prof. **W. Winiecki** (tutor), (5).
- [BSc3] Tomasz Gorbaczuk: „*Mikroprocesowy miernik napięcia stałego i zmiennego z interfejsem IEC-625*” (Microprocessor stable/changeable power meter with IEC-625 interface), Assist. Prof. **K. Adamowicz** (tutor), (5).
- [BSc4] Marcin Jastrzębski: „*Aplikacje w języku Java do prezentacji obrazów medycznych w Internecie*” (Applications in Java language for presentation of medical Images in Internet), Assist. Prof. **M. Kazubek** (tutor), (4).
- [BSc5] Sylwester Jaworski: „*Programowalne źródło sygnałów sterujących zrealizowane jako karta rozszerzająca do PC*” (Programmable source of steering signals made as an extended PC card), Assist. Prof. **K. Adamowicz** (tutor), (5).
- [BSc6] Jarosław Józwiak: „*System pomiarowy dla głośników dynamicznych z wykorzystaniem procesora sygnałowego TMS 320C26*” (The dynamic loudspeakers measuring system based on TMS 320C26 digital signal processor), Assist. Prof. **P. Bogorodzki** (tutor), (5).
- [BSc7] Robert Krzywda: „*Rezonansowa przetwornica napięcia stałego z regulatorem synchronicznym*” (The resonant DC/DC converter with synchronous one-switch regulator), Assist. Prof. **M. Mikołajewski** (tutor), (4).
- [BSc8] Michał Nowak: „*Liniowy, synfazowy szyk antenowy*” (Linear in-phase antenna array), Prof. **S. Rosłonec** (tutor), (4).
- [BSc9] Dariusz Tabor: „*Cyfrowa zwrotnica głośnikowa*” (Digital crossover network), Assist. Prof. **Z. Kulka** (tutor), (5).
- [BSc10] Szymon Wróbel: „*Tranzystorowy modulator AM na pasmo L*” (L-band transistor based AM modulator), Assist. Prof. **W. Wojtasiak** (tutor), (5).

6. PUBLICATIONS

6.1. Scientific and technical books, chapters in books

- [Pub1] K. Ignasiak, W. Skarbek: „Laboratorium multimediów” (Multimedia Laboratory), In: *„Multimedia - sprzęt i oprogramowanie”* (Multimedia - Hardware and Software), (Ed.: W. Skarbek), Academic Publishing House PLJ, Warsaw 1999, *Chapter 11*, pp. 443-502 (ISBN 83-7101-425-2).
- [Pub2] K. Ignasiak: „Programowanie sieciowe w Javie” (Network Programming in Java), In: *„Multimedia - sprzęt i oprogramowanie”* (Multimedia - Hardware and Software), (Ed.: W. Skarbek), Academic Publishing House PLJ, Warsaw 1999, *Chapter 7*, pp. 209-266, (ISBN 83-7101-425-2).
- [Pub3] A. Krupiczka: „Co to są multimedia?” (What Multimedia Means?), In: *„Multimedia - Sprzęt i oprogramowanie”* (Multimedia - Hardware and Software), (Ed.: W. Skarbek), Academic Publishing House PLJ Warsaw 1999, *Chapter 1*, pp. 15-22 (ISBN 83-7101-425-2).
- [Pub4] A. Krupiczka: „Sprzęt multimedialny” (Multimedia Hardware), In: *„Multimedia - Sprzęt i oprogramowanie”* (Multimedia - Hardware and Software), (Ed.: W. Skarbek), Academic Publishing House PLJ Warsaw 1999, *Chapter 2*, pp. 23-55 (ISBN 83-7101-425-2).
- [Pub5] A. Krupiczka: „Komunikacja multimedialna” (Multimedia Communication), In: *„Multimedia - Sprzęt i oprogramowanie”* (Multimedia - Hardware and Software), (Ed.: W. Skarbek), Academic Publishing House PLJ Warsaw 1999, *Chapter 3*, pp. 57-99 (ISBN 83-7101-425-2).
- [Pub6] K. Leja, M. Lepa, E. Mazur, T Skarbek: „Organizacja i zadania administracji uczelni”. (Organisation and Tasks of University Administration) (Ed.: R. Z. Morawski). In *„Model zarządzania publiczną instytucją akademicką”* (Ed.: J. Woźnicki), Instytut Spraw Publicznych, Warsaw 1999, pp. 247-266, (ISBN 83-86917-77-6).
- [Pub7] R. Z. Morawski: „Kryteria efektywności instytucji akademickich” (Criteria of Efficiency of Academic Institutions). In: *„Model zarządzania publiczną instytucją akademicką”* (Ed.: J. Woźnicki), Instytut Spraw Publicznych, Warsaw 1999, pp. 135-151, (ISBN 83-86917-77-6).
- [Pub8] R. Z. Morawski (Ed.): *„Efektywność funkcjonowania zachodnioeuropejskich instytucji akademickich”* (Efficiency of Functioning of West-European Academic Institutions). Instytut Spraw Publicznych, Warsaw 1999, 175 pp. (ISBN 83-86917-58-X).

- [Pub9] R. Z. Morawski: „System finansowania szkolnictwa wyższego a efektywność funkcjonowania zachodnioeuropejskich instytucji akademickich” (The System of Financing Higher Education versus Efficiency of Functioning of West-European Academic Institutions), In: *„Efektywność funkcjonowania zachodnioeuropejskich instytucji akademickich”* (Ed.: R. Z. Morawski), Instytut Spraw Publicznych, Warsaw 1999, pp. 59-116, (ISBN 83-86917-58-X).
- [Pub10] S. Rosłonec: *„Liniowe układy mikrofalowe - metody analizy i syntezy”* (Linear Microwave Circuits-Methods of Analysis and Synthesis), WKŁ, Warsaw 1999, pp. 1-276, (ISBN 83-206-1311-6).
- [Pub11] W. Skarbek (Ed.): *„Multimedia - sprzęt i oprogramowanie”* (Multimedia - Hardware and Software), Academic Publishing House PLJ, Warsaw 1999, 515. pp. (ISBN 83-7101-425-2).
- [Pub12] W. Skarbek: „Wprowadzenie do Javy” (Introduction to Java), In: *„Multimedia - sprzęt i oprogramowanie”* (Multimedia - Hardware and Software), (Ed.: W. Skarbek), Academic Publishing House PLJ, Warsaw 1999, *Chapter 4*, pp. 101-158, (ISBN 83-7101-425-2).
- [Pub13] W. Skarbek: „Kolekcje danych w Javie” (Java Collections), In: *„Multimedia - Sprzęt i oprogramowanie”* (Multimedia - Hardware and Software), (Ed.: W. Skarbek), Academic Publishing House PLJ, Warsaw 1999, *chap.5*, pp. 159-176, (ISBN 83-7101-425-2).
- [Pub14] W. Skarbek: „System operacji wejścia, wyjścia w Javie” (Input/Output System in Java), In: *„Multimedia - sprzęt i oprogramowanie”* (Multimedia - Hardware and Software), (Ed.: W. Skarbek), Academic Publishing House PLJ, Warsaw 1999, *Chapter 6*, pp. 177-208, (ISBN 83-7101-425-2).
- [Pub15] W. Skarbek: „Graficzny interfejs użytkownika w Javie” (Graphics Interface in Java), In: *„Multimedia - Sprzęt i oprogramowanie”* (Multimedia - Hardware and Software), (Ed.: W. Skarbek), Academic Publishing House PLJ, Warsaw 1999, *Chapter 8*, pp. 267-358 (ISBN 83-7101-425-2).

6.2. Scientific and technical papers in journals

- [Pub16] D. Adams, K. Zaremba et al., "The Polarized Double Cell Target of the SMC", *Nuclear Instruments & Methods in Physics Research A* 437 (1999), pp. 23-67.

- [Pub17] D. Adams, K. Zaremba et al., "A Large Streamer Chamber Muon Tracking Detector in High Flux Fixed Target Application", *Nuclear Instruments & Methods in Physics Research A* 435 (1999) pp. 354-374.
- [Pub18] B. Adeva, K. Zaremba, et al., "Spin Asymmetries A, of the Proton and the Neutron in the Low X and Low Q² Region from Polarized High Energy Muon Scattering", *Physical Review*, D60, (1999), pp. 072004-1 - 072004-9.
- [Pub19] A. Barwicz, R. Z. Morawski: "Teaching Measuring Systems Beyond the Year 2000", *IEEE Instrumentation and Measurement Magazine*, (March 1999), pp. 20-27.
- [Pub20] M. Ben Slima, R. Z. Morawski, A. W. Kraszewski, A. Barwicz, S. O. Nelson: "Calibration of a Microwave System for Measuring Grain Moisture Content", *IEEE Trans. Instrum. & Meas.*, Vol.48, No.3, (June 1999), pp. 778-78.
- [Pub21] M. Celuch-Marcysiak, W. Gwarek: „On the Nature of Solutions Produced by Finite Difference Schemes in Time Domain”, *International Journal of Numerical Modelling* Vol.12, 23-40, (1999), pp. 23-40.
- [Pub22] K. Ignasiak, W. Skarbek, M. Ghuwar: "Invariant Reference Points Methodology and Applications" in *Computer Analysis of Images and Patterns*, (Ed.: F. Solina, G. Sommer), Lecture Notes in *Computer Science*, Springer, (1999), pp. 259-266.
- [Pub23] A. Iraqi, R. Z. Morawski, A. Barwicz, W. J. Bock: "Distributed Data Processing in a Telemetric System for Monitoring Civil Engineering Structures", *IEEE Trans. Instrum. & Meas.*, Vol.48, No.3, (June 1999), pp. 773-777.
- [Pub24] T. Jamrógiewicz, „Uniwersalna magistrala szeregową USB (USB-Universal Serial Bus), komentarz normalizacyjny SEP (Description of Standard), Centralny Ośrodek Szkolenia i Wydawnictw (COSIW) SEP, Warsaw, Poland, No. K SEP-I-30007 (1999), pp. 1-49.
- [Pub25] T. Jamrógiewicz, „Szybka magistrala szeregową IEEE 1394” (IEEE-1394 High Performance Serial Bus), komentarz normalizacyjny SEP (Description of Standard), Centralny Ośrodek Szkolenia i Wydawnictw (COSIW) SEP, Warsaw, Poland, No. K SEP-I-30007 (1999), pp. 1-23.
- [Pub26] E. Kotarbińska: „Hałas w środowisku pracy” (Working Environmental Noise), *Ekopartner, Centralny Instytut Ochrony Pracy* (Central Institute for Labour Protection), No.5 (90), (May 1999), ISSN 1230-2961 Indeks No.333719, pp. 8-9.
- [Pub27] J. Krupka, K. Derzakowski, A. Abramowicz, M. E. Tobar, R. G. Geyer: "Use of Whispering Gallery Modes for Complex Permittivity Determinations of Ultra-Low-Loss Dielectric Materials", *IEEE Transactions on Microwave Theory and Techniques*, Vol.47, No.6.(June 1999), pp. 752-759.
- [Pub28] J. Krupka, K. Derzakowski, M. Tobar, J. Hartnett, R. G. Geyer: "Complex Permittivity of Some Ultralow Loss Dielectric Crystals at Cryogenic Temperature", *Measurement Science and Technology*, Vol.10, Issue 5, (UK, May 1999), pp. 387-392.
- [Pub29] J. Krupka, K. Derzakowski, S. Gabelich, B. Pierce: "Comparison of Split-Post Dielectric Resonator and Ferrite Disc Resonator Techniques for Complex Permittivity Measurements of Polycrystalline Yttrium Iron Garnet", *Measurement Science and Technology*, Vol.10, Issue 11, (UK, November 1999), pp. 1004-1008.
- [Pub30] Z. Kulka: „TACT Millennium - pierwszy w pełni cyfrowy foniczny wzmacniacz mocy” (TACT Millennium - a True Digital Audio Power Amplifier), *Sat-Audio-Video*, No.2, (1999), pp. 13-16.
- [Pub31] Z. Kulka: „Procesory c/a 360 i 360S oraz wzmacniacze 334, 335 i 336 firmy Madrigal” (Madrigal's 360, 360S D/A Conversion Systems and 334, 335, 336 Audio Amplifiers), *Sat-Audio-Video*, No.3, (1999) pp. 16-18.
- [Pub32] Z. Kulka: „Wzmacniacz cyfrowy Wadia 790 PowerDAC” (Wadia790 PowerDAC), *Sat-Audio-Video*, No.5, (1999), pp. 16-19.
- [Pub33] Z. Kulka: "Standard zapisu DVD-Audio” (DVD-Audio - a New Digital Format), *Sat-Audio-Video*, No.5, (1999), pp. 58-63.
- [Pub34] Z. Kulka: "Arcam Alpha 9 - 24-bitowy odtwarzacz CD” (24-bit CD Player Arcam Alpha 9), *Sat-Audio-Video*, No.6, (1999), pp. 13-16.
- [Pub35] Z. Kulka: "High-End' 99 - wystawa frankfurcka” (High-End' 99, Frankfurt), *Sat-Audio-Video*, No 9, (1999), pp. 13-19.
- [Pub36] Z. Kulka: „SCD-1 - pierwszy odtwarzacz płyt Super Audio CD”, cz.1, 2, 3 (SCD-1 - a First Super Audio CD Player, parts 1, 2, 3), *Audio-Video*, No.9, pp. 59-62, No.10, pp. 68-72, No.11, (1999), pp. 70-72.
- [Pub37] Z. Kulka: „Osiągnięcia Fraunhofer IIS w kodowaniu danych audio i wideo” (Achievements of Fraunhofer IIS in Audio and Video Data Coding), *Sat-Audio-Video*, No.12, (1999), pp. 21-24.
- [Pub38] J. Mirkowski, Z. Pawłowski, A. Piątkowski et al., "The GIBS Magnetic Spectrometer", *Instruments and Exp. Tech.*, Vol.42, No.3 (1999), pp. 310-317.
- [Pub39] J. Modelski, W. Winięcki, P. Brzeski.: „Instytut Radioelektroniki Wydziału Elektroniki i Technik Informacyjnych Politechniki Warszawskiej” (Institute of

- Radioelectronics, Faculty of Electronics and Information Technology, Warsaw University of Technology), *Przegląd Telekomunikacyjny*, No. 9-10, (1999), pp. 579-582.
- [Pub40] A. Przelaskowski, "Coding of Non-Smooth Images in Lossless Manner", *Proc. of SPIE, Multimedia Storage and Archiving Systems IV*, vol. 3846, (1999), pp. 432-440.
- [Pub41] W. Skarbak, A. Pietrowcew, R. Sikora: "Modified Oja-RLS Algorithm - Stochastic Convergence Analysis and Application for Image Compression" In: *Foundations of Intelligent Systems*, (Ed.: Z. W. Ras, A. Skowron), Lecture Notes in *Artificial Intelligence 1609*, Springer (1999), pp. 402-410.
- [Pub42] W. Skarbak: "Perceptual Convergence of Discrete Clamped Fractal Operator" in *Foundations of Intelligent Systems*, (Ed.: Z. W. Ras, A. Skowron), Lecture Notes in *Artificial Intelligence 1609*, Springer (1999), pp. 395-401.
- [Pub43] W. Skarbak: "On Convergence of Discrete and Selective Fractal Operators" in *Computer Analysis of Images and Patterns*, (Ed.: F. Solina, G. Sommer), Lecture Notes in *Computer Science 1689*, Springer, (1999), pp. 81-88,
- [Pub44] W. Skarbak, A. Pietrowcew: „Image Compression by Approximated 2D Karhunen Loeve Transform" In: *Computer Analysis of Images and patterns*, (Ed.: F. Solina, G. Sommer), Lecture Notes in *Computer Science 1689*, Springer, (1999), pp. 81-88.
- [Pub45] D. Włoskiewicz, K. Łukaszewicz, K. Radecki: "Implementation of Synthetic Speech in Phone Communication System for Deaf-Mute People", *Polish Journal of Medical Physics and Engineering*, (1999), Vol.5, No.1, pp. 33-39.
- [Pub46] M. Wiśniewski, R. Z. Morawski, A. Barwicz: "Modelling a Micro-Spectrometer for Numerical Correction of its Metrological Parameters", *IEEE Trans. Instrum. & Meas.*, Vol.48, No.3, (June, 1999), pp. 747-752.
- [Pub47] A. Abramowicz, J. Modelski: „Filtry i zwrotnice mikrofalowe w systemach telefonii komórkowej”, (Microwave Filters and Multiplexers for Cellular Telephony), *Mat. Krajowej Konferencji Radiodiffuzji i Radiokomunikacji KKRR'99*; Proc. of National Conference on Radiodiffusion and Radiocommunication (Poznań, Poland, May 18-20, 1999), pp. 242-245.
- [Pub48] J. Barełkowski, T. Buczkowski, T. Rocznik, T. Olichwer, A. Pazda: „System radiowego sterowania mocą w spółkach dystrybucyjnych” (Radio Load Management System for Electric Power Distribution Companies) *Mat. Seminarium Polskiego Towarzystwa Przesytu i Rozdziału Energii Elektrycznej* : Proc of the Seminar of Polish Society for Energy Transfer and Distribution, (Nałęczów, Poland, January 27, 1999): Ed.: Poznań, January 1999, pp. 10-15.
- [Pub49] B. Blagitko, V. Brygilewicz, R. Rabyk, J. Wojciechowski: "An Approach to Ambiguity Problems in Parameter Identification of Linear Circuits", *Proc. of the Polish - Ukraine School - Seminar: Problems of Contemporary Circuit Theory*, (Alusztá, Ukraine, September 1999), pp. 99-105.
- [Pub50] P. Bobiński, R. Łukaszewski, W. Winiecki: „Koncepcja projektowania rozproszonych systemów pomiarowych z interfejsem IEC-625 z wykorzystaniem języka Java” (A Concept of Distributed IEC-625 Measuring Systems Designing Using JAVA), *Mat. XXXI Międzyuczelnianej Konferencji Metrologów MKM'99*; Proc. of the XXXI-st Inter-University Metrologists' Conference, (Białystok, Poland, September 7-10, 1999), pp. 189-194.
- [Pub51] P. Bobiński, R. Leoniak, R. Łukaszewski, W. Winiecki: „System do badania odchyłek częstotliwości nadajników UKF/TV w zakresie do 1 GHz” (A Measuring System for Carrier Frequency Offset Measurement of UKF/TV Transmitters in the Range 1 GHz), *Mat. IV Szkoły-Konferencji „Metrologia Wspomagana Komputerowo - MWK'99*”, Proc. of the IV School-Conference „Computer - Aided Metrology”, (Zegrze, Poland, June 7-10, 1999), Vol. 2, pp. 173-178.
- [Pub52] P. Bogorodzki, T. Wolak, J. Wasilewski, A. Piątkowski: "Real Time Implementation of the Parametric Imaging Correlation Algorithms", *Proc. of the European Medical & Biological Engineering Conference EMBE'99, Vol.37, Supplement 2*, (Vienna, Austria, November 4-7, 1999), pp. 1590-1591.
- [Pub53] A. Borecki, G. Domański, B. Konarzewski, J. Marzec, Z. Pawłowski, K. Zaremba: „System z głowicą scyntylicyjną do przesiewowych badań gęstości składnika mineralnego kości” (System with Scintillating Head for Mineral Bone Density Screening), *Mat. XI Zjazdu Polskiego Towarzystwa Fizyki Medycznej „Fizyka i Inżynieria we Współczesnej Medycynie i Ochronie Zdrowia*”, Proc. of the XI Congress of Polish Society of Medical Physics "Physics and Engineering in Contemporary Medicine and Health Protection" (Warsaw, Poland, 1999), pp. 60-61.
- [Pub54] A. Buchowicz: „Zdalny pomiar parametrów toru telewizyjnego-oprogramowanie klienta”

- (Remote Measurements of the Parameters of Television Circuits-Client Software), *Materiały VI Symposium „Nowości w Technice Audio”*, Proc of the VI-th Symposium "News in Audio Technique", (Warsaw, Poland, October 22-23, 1999), pp. 143-150.
- [Pub55] T. Buczkowski, K. Czerwiński, D. Janusek, T. Kosiło: „Radiowy długofalowy system transmisji danych” (Long Wave Radio Data Transmission System), *Mat. IX Krajowego Symposium Nauk Radiowych URSI'99* Proc. of the National Symposium on Radio Science URSI'99, (Poznań, Poland, March 16-17, 1999), pp. 79-84.
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- [Pub57] T. Buczkowski, K. Radecki: „Systemy nawigacyjno-informacyjne dla niewidomych” (Navigation and Information Systems for the Blind), *Mat. Seminarium Ośrodka Szkolno-Wychowawczego dla Dzieci Niewidomych*, (Laski, Poland, November 25, 1999) IBIB PAN / PHARE, p. 22.
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- [Rep16] Z. Kulka, R. Zawadzki „Opracowanie koncepcji pomiaru fluktuacji okresu próbkowania (jittera) sygnałów zegarowych przetworników cyfrowo-analogowych stosowanych w odtwarzaczach CD, MD i DVD” (Method for Measurement of Timing Jitter in the Clocks Used for D/A Converters in CD, MD and DVD Players), Final report for the Rector grant, Institute of Radioelectronics, WUT, (No.503/034/389/8) Warsaw, September 1999, 10 pp.
- [Rep17] Z. Kulka: „Badania i optymalizacja układu elektronicznego do naszników przeciwhałasowych z regulowanym tłumikiem” (Design and Optimization of Electronic Circuit for Level-Dependent Ear-Muffs), Final report for Central Institute for Labor Protection, (No.501 E/1300) Warsaw, September, 1999, 42 pp.
- [Rep18] J. Marzec, K. Zaremba, Z. Pawłowski, B. Konarzewski ”Straw Tube Electrical Properties - Part II” COMPASS Note 1999-1, <http://wwwcompass.cern.ch/compass/notes/>, grant KBN SPUB (No.621/E-78/SPUB/P03/021/97), 21 pp.
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- [Rep20] J. Modelski, W. Skarbek, A. Buchowicz, Z. Kozłowski, K. Ignasiak, J. Kondarewicz, J. Marzyjanek, M. Olszowy, T. Smakuszewski, K. Wnukowicz, K. Ebert, E. Snitkowska: „Metody analizy i projektowania układów i systemów telewizyjnych” (Methods of Analysis and Design of the TV Circuits and Systems), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No.503/034/036/8) Warsaw, April 1999, 110 pp.
- [Rep21] J. Modelski, T. Kosiło, T. Krzymień: „Wymagania systemowe na system GSM-R dla linii CMK 200-250 km/h” (System Requirements for GSM-R at CMK Railway Line 200-250 km/h), No 501E/1210, Final report for National Railways Scientific and Technical Center - PKP-Centrum Naukowo-Techniczne Kolejnictwa, Warsaw, April, 1999, 98 pp.
- [Rep22] J. Modelski, T. Kosiło, T. Krzymień: „Wymagania funkcjonalne na system GSM-R dla linii CMK 200-250 km/h (Functional Requirements for GSM-R at CMK Railway Line 200-250 km/h), Final report for National Railways Scientific and Technical Center - PKP-Centrum Naukowo Techniczne Kolejnictwa, Warsaw, April, 1999, 60 pp.
- [Rep23] J. Modzelewski, J. Ebert, M. Mikołajewski, A. Owczarek, K. Puczko, A. Wajs: „Doskonalenie, analiza i modelowanie rezonansowych wzmacniaczy mocy wielkiej częstotliwości klasy D” (Improvement, Analysis and Modelling of Class-D High-Frequency Tuned Power Amplifiers), Final report for the KBN grant, Warsaw, October 1999, 120 pp.
- [Rep24] R. Morawski, A. Miękina, A. Podgórski, T. Szafrąński: „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, (503/034/036/8) Warsaw, April 1999, 42 pp.
- [Rep25] R. Z. Morawski, M. Chudy, P. Kluk, A. Miękina, G. Misiurski, C. Niedziński, A. Podgórski, P. Sprzęczak, T. Szafrąński, N. L. Hung, A. Witan: „Algorytmy poprawiania charakterystyk metrologicznych aparatury stosowanej w monitoringu środowiska naturalnego” (Algorithms for Improving Metrological Characteristics of Instrumentation Applied in Environmental Monitoring), Final report for the KBN grant, Warsaw, June, 1999, 450 pp.
- [Rep26] T. Morawski, S. Rostłonec, W. Wojtasiak, J. Zborowska, D. Gryglewski, R. Michnowski, M. Kukier „Mikrofalowe podzespoły systemów radiolokacyjnych i systemów sterowania obiektami” (Microwave Subsystems for Radiolocation and Flying Objects Control), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No.503/034/398/8) Warsaw, June 1999, 25 pp.
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- [Rep28] T. Morawski, W. Wojtasiak, J. Zborowska, D. Gryglewski, R. Michnowski, M. Kukier: „Metody pomiaru parametrów mikrofalowych układów aktywnych pracujących impulsowo” (Measurement Methods of Pulsed Microwave

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- [Rep29] Z. Pawłowski, A. Borecki, G. Domański, B. Konarzewski, J. Marzec, K. Zaremba: „*Aparatura do skaningowych badań gęstości tkanek kostnych*” (Scanning System for Bone Density Measurements), Final report for the priority grant, Institute of Radioelectronics, WUT, Warsaw, May 1999, 12 pp.
- [Rep30] Z. Pawłowski, B. Konarzewski, J. Marzec, K. Zaremba, G. Domański, „*Optymalizacja scyntylacyjnych sensorów obrazów do radiografii cyfrowej*” (The Optimisation of Scintillating Imaging Sensors for Digital Radiography), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No.503/034/396/8) Warsaw, June 1999, 30 pp.
- [Rep31] Z. Pawłowski, M. Kazubek, R. Szabatin, P. Bogorodski, P. Brzeski, D. Ćwiek, L. Padee, G. Domański, T. Jamrógiewicz, J. Marzec, B. Konarzewski, J. Mirkowski, T. Olszewski, E. Piątkowska-Janko, A. Piątkowski, A. Przelaskowski, W. Smolik, J. Wasielewski, A. Wasielewski, K. Zaremba: „*Metody radiacyjne w technikach medycznych*” (Radiation Techniques in Medicine), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No.503/034/036/8) Warsaw, April 1999, 26 pp.
- [Rep32] A. Piątkowski, E. Piątkowska-Janko, P. Bogorodski, J. Wasielewski, G. Opolski: „*Metody i urządzenia do jednoczesnej rejestracji przetwarzania i analizy potencjałów przedsińkowych i komorowych z jednoczesnym wspomaganem diagnozy*” (Methods and Instrumentation for the Simultaneous Registration and Processing of Ventricular and Atrial Late Potentials), Final report for the KBN grant, Warsaw, August, 1999, 94 pp.
- [Rep33] A. Przelaskowski: „*Efektywne metody kompresji danych*” (Effective Methods of Data Compression), Final report for the Rector grant, Institute of Radioelectronics, WUT, (No.503/034/393/8) Warsaw, June 1999, 104 pp.
- [Rep34] W. Skarbak, P. Bobiński, A. Buchowicz, G. Galiński, K. Ignasiak, T. Jamrógiewicz, 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: „*Wirtualne laboratorium w Internecie*” (Virtual Laboratory accessible via Internet), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No.503/034/394/8) Warsaw, June 1999, 280 pp.
- [Rep35] W. Skarbak: „*Prototyp zintegrowanego systemu cyfrowego monitoringu telewizyjnego z użyciem kodowania wideo MIE G1*” (The Prototype of Integrated Digital Monitoring System Using MPEG Standard), Final report for POLIXEL S.A., (No.501E/1306) Warsaw, August, 1999, 20 pp.
- [Rep36] W. Smolik, D. Ćwiek: „*Zastosowanie algorytmów genetycznych w bayesowskiej rekonstrukcji obrazów z projekcji w tomografii emisyjnej*”. (Application of Genetic Algorithms in Bayes Reconstruction of Images from Projection in Emission Tomography), Final report for the priority grant, Institute of Radioelectronics, WUT, Warsaw, May 1999, 12 pp.
- [Rep37] W. Winiecki, A. Owczarek, A. Sielski, M. Sypniewski, A. Więckowski: „*Modernizacja sieci komputerowej IR PW*” (Development of the Institute’s Computer Network), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No.503/034/036/8) Warsaw, April 1999, 10 pp.
- [Rep38] W. Winiecki, K. Adamowicz, P. Bobiński, R. Leoniak, P. 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.503/034/036/8) Warsaw, April 1999, 35 pp.
- [Rep39] W. Winiecki: „*Analiza możliwości funkcjonalnego rozwoju systemu GigaAnritsu* (Development of GigaAnritsu Radiomonitoring System), Final report for National Radiocommunication Agency PAR-Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR, (No 501 E/1290), Warsaw, December, 1999, 76 pp.
- [Rep40] J. Wojciechowski, „*Projektowanie układów w oparciu o elipsoidalną aproksymację obszaru ograniczeń*”. (Design Techniques on the Piecewise Ellipsoidal Approximation to the Constraint Region), Final report for the Dean grant, Institute of Radioelectronics, WUT, (No.503/034/399/8) Warsaw, June 1999, 18 pp.
- [Rep41] J. Wojciechowski, J. Jarkowski, H. Chaciński, A. Fiok, J. Cichocki, J. Kołakowski, K. Radecki, S. Żmudzin, T. Kosiło, T. Buczkowski, K. Czerwiński, D. Janusek, W. Kazubski: „*Radiowa transmisja danych*” (Selected Problems of Data Radio Transmission), Final report for the statutory grant, Institute of Radioelectronics, WUT, (No.503/034/036/8) Warsaw, April 1999, 38 pp.
- [Rep42] J. Wojciechowski: „*Symulacja i projektowanie sterowanych przełączników mocy*” (Simulation and Design of Switched Power Converters), Final report for the KBN grant, Warsaw, July 1999, 61 pp.
- [Rep43] J. Wojciechowski: „*Zastosowania kombinatoryki i optymalizacja dyskretna w zagad-*

nieniach sieciowych" (Applied Combinatorics and Discrete Optimization), Final report for the priority grant, Institute of Radio-electronics, WUT, Warsaw, May 1999, 6 pp.

- [Rep44] W. Wojtasiak: „*Opracowanie i wykonanie źródła szumowego.*” (Design and Construction of Broad-Band Noise Source), Final report for Military Technical Institute of Weapons-Wojskowy Instytut Techniczny Uzbrojenia, (No.501E/1309) Warsaw, December, 1999, 20 pp.
- [Rep45] K. Zaremba Z. Pawłowski, J. Marzec, B. Konarzewski, G. Domański,: „*Eksperyment COMPASS-budowa aparatury i przygotowanie oprogramowania, II etap.*” (COMPASS Experiment-Design of Apparatus and Software Development), Final grant fund by Soltan Institute for Nuclear Studies-Institut Problemów Jądrowych, Świerk, Warsaw, June 1999, 21 pp.
- [Rep46] K. Zaremba: „*Spektrometria promieniowania X i gamma w badaniach tkanek kostnych*” (X and Gamma Ray Spectrometry for the Bone Composition Determination), Final report for the Rector grant, Institute of Radio-electronics, WUT, (No.503/034/387/8) Warsaw, June 1999, 45 pp.

8. PATENTS

8.1. Home Patents

- [Pat1] M. Mikołajewski: „*Tranzystorowy przemiennik częstotliwości*” (Transistorised frequency converter), Patent RP, P.313 467, October 22, 1999.
- [Pat2] M. Mikołajewski: „*Prostownik synchroniczny z transformatorem*” (A Synchronous Rectifier with a Transformer), Patent RP, PL 177578 B3, November 31, 1999;
- [Pat3] J. Modzelewski: „*Sposób modulacji amplitudy i wielomodułowy wzmacniacz mocy wielkiej częstotliwości kl.D z modulacją amplitudy*” (A Method of Amplitude Modulation and a High-Power High-Frequency Amplitude Modulator Combining Power of Class-D Amplifiers), Patent RP, PL 175738 B1, February 26, 1999.

8.2. International Patents

- [Pat4] R. Z. Morawski, A. Barwicz, M. Ben Slima, A. Miękina: „*Method of interpreting spectrometric data*”, United States Patent 5,991,023, November 23, 1999
- [Pat5] A. Barwicz, R. Z. Morawski, M. Ben Slima: „*Apparatus and method for light spectrum measurement*”, United States Patent 6,002,479, December 14, 1999.

9. CONFERENCES, SEMINARS AND MEETINGS

9.1 International conferences

- [Con1] *Technical Programme Committee Meeting of the IEEE MTT International Microwave Conference*, (Los Angeles, USA, January 7-12, 1999), W. Gwarek, J. Modelski (session chairmen).
- [Con2] *IX European Committee on Description of Standard CEN/TC 159: "Sound Protectors"* (Torino, Italy, January 14-15, 1999), E. Kotarbińska (participant).
- [Con3] *International Conference MICROCOLL*, (Budapest, Hungary, March 21-24, 1999), K. Derzakowski J. Modelski (speakers).
- [Con4] *Technical Programme Committee Meeting of the European Microwave Conference EuMC-99*, (Munich, Germany, April 14-16, 1999), J. Modelski (member of the Technical Programme Committee).
- [Con5] *9-th International Conference Measurement'99*, (Bratysłava, Slovakia, April 26-29, 1999), A. Miękina (speaker, session chairman).
- [Con6] *International Conference Radioelectronics'99*, (Brno, Czech Republic, April 27-28 1999), J. Kołakowski W. Winiecki, (speakers), P. Bobiński, D. Grabowski, R. Leoniak, R. Łukaszewski, S. Maszczyk (participants).
- [Con7] *IEEE Instrumentation & Measurement Technology Conference- IMTC'99*, (Venice, Italy, May 24-26, 1999), R. Z. Morawski, C. Niedziński (speakers).
- [Con8] *IEEE MTT International Microwave Symposium* (Los Angeles, USA, June 12-19, 1999), W. Gwarek, J. Modelski (session chairmen).
- [Con9] *XV-th IMEKO World Congress*, (Osaka, Japan, June 13-18, 1999), R. Z. Morawski (member of the General Council, speaker, session chairman).
- [Con10] *International IMEKO TC-7 Workshop*, (Kyoto, Japan, June 20-2, 1999), R. Z. Morawski (speaker, session chairman).
- [Con11] *World Multiconference on Systemics, Cybernetics-SCI'99 and 5-th International Conference on Informatic Systems-ISAS'99* (Florida, USA, July 30-August 5 1999), W. Skarbek (participant).
- [Con12] *European Conference on Circuit Theory and Design*, (Stressa, Italy, August, 28-September 3 1999), J. Wojciechowski (speaker).
- [Con13] *Applied Electronics'99* (Pilsen, Czech Republic, September 5-11, 1999), J. Jarkowski (speaker).
- [Con14] *IEEE MTT'99*, (Lieuvén, Belgium, September 10-13, 1999), J. Modelski (Region 8 Coordinator).
- [Con15] *International ICEAA'99 Conference*, (Torino, Italy, September 13-17, 1999), K. Derzakowski (speaker).
- [Con16] *Kleinheubacher Tagung Symposium*, (Frankfurt, September 26-October 2 1999), S. Hahn, J. Jarkowski, K. Snopek, (speakers).
- [Con17] *European Microwave Conference*, (Munich, Germany, October 4-8, 1999), J. Modelski (session chairman, speaker), K. Derzakowski (participant).
- [Con18] *European Medical & Biological Engineering Conference EMBEC'99*, (Vienna, Austria, November 4-7, 1999), P. Bogorodzki, W. Smolik (speakers), A. Piątkowski (participant).
- [Con19] *UMIST*, (Manchester, Great Britain, November 12-19, 1999), J. Mirkowski T. Olszewski (speakers).

9.2. Local conferences

- [Con20] *Reprogramowalne Układy Cyfrowe Reprogramming Digital Systems-RUC'99*, (Szczecin, Poland, January, 1999), A. Gałat K. Mroczek, (participants).
- [Con21] *XI-th Congress of Polish Society of Medical Physics "Physics and Engineering in Contemporary Medicine and Health Protection"* XI Zjazd Polskiego Towarzystwa Fizyki Medycznej "Fizyka i Inżynieria we Współczesnej Medycynie i Ochronie Zdrowia", (Warsaw, Poland, February 4-5 1999), G. Domański, B. Konarzewski, J. Marzec, Z. Pawłowski, K. Zaremba, (participants).
- [Con22] *IX National Symposium on Radio Science URSI'99* (IX Krajowe Sympozjum Nauk Radiowych), (Poznań, March 16-17, 1999), K. Radecki, (session and commission chairman, speaker), J. Jarkowski, T. Kosiło, M. Kukier, K. Snopek (participants).
- [Con23] *National Conference on Radiodiffusion and Radiocommunication;* (Krajowa Konferencja Radiodyfuzji i Radiokomunikacji), (Poznań, May 18-20, 1999), J. Modelski (member of the TPC, session chairman, speaker), D. Gryglewski, J. Kołakowski (speaker), S. Maszczyk, Z. Walczak, J. Wojciechowski, (participants).
- [Con24] *III-rd National Conference: Evolutionary Algorithms and Global Optimization*, (III Krajowa Konferencja: Algorytmy Ewolucyjne i Optymalizacja Globalna (Potok Złoty May 25-28, 1999), B. Sawionek, Z. Walczak, J. Wojciechowski, (participants).

- [Con25] *Konferencja „Metrologia Wspomagana Komputerowo - MWK'99”* Conference: Computer - Aided Metrology (Zegrze, Poland, June 7-10, 1999), R. Łukaszewski (speaker), W. Winiecki (participant).
- [Con26] *X-th Microwave Military Conference; Mikrofalowa Wojskowa Konferencja-Sterowanie i Regulacja w Radiolokacji i Obiektach Latających*, (Jelenia Góra, June 9-11, 1999), D. Gryglewski, R. Łukaszewski, W. Wojtasiak, (participants).
- [Con27] *XXXI-st Inter-University Metrologists' Conference: XXXI Międzyuczelniana Konferencja Metrologów MKM'99*, (Białystok, September, 7-9, 1999), W. Winiecki (session chairman), P. Bobiński, A. Podgórski, (speakers). A. Fiok, R. Z. Morawski (participants)
- [Con28] *XV Krajowe Sympozjum Telekomunikacji KST'99*, (Bydgoszcz, Poland, September 9-10, 1999), S. Hahn, J. Modelski (members of the Technical Programme Committee).
- [Con29] *ISSEM-International Symposium on Sound Engineering and Mastering ; Międzynarodowe Sympozjum Inżynierii i Reżyserii Dźwięku* (Gdańsk, September 9-11, 1999), Z. Kulka M. Tajchert (participants).
- [Con30] *XXII-nd Conference on Circuits Theory and Electronic Systems; XXII Krajowa Konferencja Teoria Obwodów i Układy Elektroniczne KKT0iUE* (Stare Jabłonki, October 20-23, 1999), T. Morawski (session chairman), J. Wojciechowski (session chairman), M. Mikołajewski, J. Modzelewski, P. Sokołowski, M. Sypniewski, A. Wajs (speakers).
- [Con31] *VI-th Symposium; News in Audio Technique; Audio Technique and Multimedia-VI Sympozjum „Nowości w Technice Audio”* Technika Audio a Multimedia (Warsaw, October 22-23, 1999), Z. Kulka (member of the Scientific Committee, member of the Organizing Committee) W. Skarbek, (member of the Scientific Committee, member of the Organizing Committee) J. Modelski, W. Winiecki (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] *III Ogólnopolska Konferencja Kształcenie Ustawiczne Inżynierów i Menażerów KUIM'99*, (Kielce, October 25-27, 1999), A. Miękina (participant).
- [Con33] *III-rd Symposium on Dynamic Measurements* III Sympozjum Pomiarów Dynamicznych, (Gliwice, November 9-10, 1999), R. Z. Morawski (speaker).
- [Con34] *Z EAN w XXI wiek*, (Poznań, November 16-17, 1999), B. Sawionek (participant).

9.3. Schools, seminars and meetings

- [Con35] *Seminarium Polskiego Towarzystwa Przesyłu i Dystrybucji Energii*, Proc of the Seminar of Polish Society for Energy Transfer and Distribution, (Nałęczów, Poland, January 27, 1999), T. Buczkowski (participant).
- [Con36] *Seminarium Naukowe Sekcji Kształcenia Komitetu Metrologii PAN (Scientific Meeting of the Education Section of the Metrology and Instrumentation Committee , Polish Academy of Science)*, (Ustronie k/Kępna, January 4-6, 1999), W. Winiecki (speaker)
- [Con37] *XXVIII Zimowa Szkoła Zwalczenia Zagrożeń Wibroakustycznych*, XXVIII Winter School on Vibration Control, (Gliwice-Ustroń, Poland, February 22-27, 1999), E. Kotarbińska (participant).
- [Con38] *I Forum Tematyczne Stowarzyszenia „Sieć”*, I-st Theme Forum of "Network" Society, (Warsaw, Poland, May 27-28, 1999), T. Buczkowski (participant).
- [Con39] *XLVI Otwarte Seminarium z Akustyki: OSA'99*, XLVI Open Seminar on Acoustics, (Cracow-Zakopane, Poland, September 14-17, 1999), E. Kotarbińska (participant).
- [Con40] *54-th ICB - International Seminar on Multimedia, Data Integration, Medical Databases; 54 Międzynarodowe Seminarium Multimedia, Integracja Danych, Medyczne Bazy Danych* (Warsaw, Poland, October 18-23, 1999), A. Przelaskowski, W. Smolik (speakers).
- [Con41] *Seminarium Ligi Zwalczenia Hałasu* (Jastrzębia Góra, Poland, November 18-19, 1999), M. Tajchert (participant).
- [Con42] *Seminar on Navigation and Information Systems for Blind People*, Ośrodek Szkolno-Wychowawczy dla Dzieci Niewidomych (Laski/Warsaw, November 25, 1999), T. Buczkowski, K. Radecki (speakers).
- [Con43] *XXIII Warsztaty Naukowo-Szkoleniowe Audiologii; XXIII Workshop on Audiology* (Jachranka/Warsaw, Poland, December 10-11, 1999), A. Leszczyński (invited speaker).

10. STATISTICAL DATA

SPECIFICATION	1996	1997	1998	1999
academic staff				
total	55,5	59,5	60,7	62,73
full professors	4	4	4	4,5
professors	5	7	7	6
assistant professors	31,5	32,5	38,5	42,5
senior lecturers	2	4	5,30	4,83
lecturers	2,5	3	2,90	2,9
assistants	10,5	9	3,00	2
Ph.D. students				
total	22	26	36	39
regular	16	21	27	31
part-time	6	5	9	8
technical and administrative staff				
total	29,5	35,25	27,00	25,00
R&D associates	20,5	15,25	15,00	14
administrative associates	7	8	9	9
service workers	2	2	3	2
space				
total	2415,1	2415,1	2415,1	2549,1
laboratories	1038,3	1038,3	1038,3	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	125	164	218	291
workstations	4	4	4	5
personal computers	121	160	214	286
library resources				
books (number of volumes)	12239	12657	12866	13629
books (number of titles)	7071	7251	7418	7624
journals (number of titles subscribed to)	28	28	30	59
teaching activities				
basic courses	39	36	28	27
advanced courses	44	40	50	45
other courses	24	23	11	25
international projects	2	4	3	2
research projects				
total	54	63	51	49
granted by the University	26	23	25	27
granted by the State institutions	12	12	10	7
other projects	16	28	16	15
degrees awarded				
Ph.D. degrees	2	4	6	3
M.Sc. degrees	40	46	63	46
B.Sc. degrees	0	0	3	10
publications				
total	109	111	120	119
sci.-tech. books and chapters in books	3	7	15	15
sci.-tech. papers in journals	31	28	22	23
sci.-tech. papers in conference proceedings	72	70	66	68
textbooks	2	1	2	2
other publications	1	5	15	11
research reports	20	21	35	45
patents granted	2	1	1	3
conferences				
number of conferences attended by the staff	32	35	37	39
number of participants from the Institute	76	77	62	94



LABORATORY FOR TESTING OF AUDIO-VISUAL EQUIPMENT LAV

Audio-visual Equipment Testing Laboratory „LAV“ is a cell of Institute of Radioelectronics founded to test audio-visual equipment.

The laboratory has got accreditation No: L 233 of Polish Centre for Testing and Certification in the field of testing audio amplifiers, low-frequency channels in general purpose equipment, receivers and tuners AM and FM and television receivers.

The accreditation means that the Laboratory has implemented Quality System and in its activity the Laboratory follows the rules included in the EN-45001 norm „General criteria for the operation of testing laboratories“ and in the ISO/IEC-25 guide „General requirements for the technical competence of testing laboratories“. The employees of the Laboratory participate in the works of the Polish Committee for Standardization which aim to incorporate international standards into the national standardization.

Tasks of the Laboratory include: measuring technical parameters of general purpose audio-visual equipment and testing effects of climatic hazards.

Scope of testing (testing covered by accreditation is written in italics)

1. Testing of amplifiers and low-frequency channels

The measurements cover the following aspects: the input-output parameters, *the transfer characteristics, non-linear and intermodulation distortion, noise, hum crosstalk, separation*, and differences in amplification and phase in case of multichannel amplifiers.

The measurements meet the requirements of the norms IEC 268 IEC 581 and IEC 1096.

2. Testing of receivers and tuners

Testing of AM and FM receiving channels covers: *input-output characteristics, selectivity, sensitivity*, characteristics of weighted and unweighted signal-to-noise ratio, *harmonic distortion versus modulating frequency, high-frequency signal level*, and output power. Additionally in FM channels of radio receivers, following parameters are measured: homogeneity in stereophonic channels and *crosstalk suppression, capture ratio, suppression of amplitude modulation*, signal-to-noise ratio in stereophonic mode, threshold of operation and switch-on hysteresis of stereophonic decoder, *harmonic distortion versus deviation*.

The measurements meet the requirements of international norms, such as:

- IEC315-1 and IEC315-3 for AM receiving devices;
- IEC315-1, IEC315-4 and IEC581 for FM sound receiving channels.

3. Testing of television receivers

The Laboratory offers measurements of:

- photometric and colorimetric parameters - according to the norm IEC 107-1 including: *luminance and contrast, white uniformity and*

white balance, colour purity, convergence, geometric distortion.

- electrical parameters of the sound channel, including Hi-Fi mono/stereo and dual channel sound FM carrier system (A2, BG and A2, DK) - according to the norms IEC 107-1, IEC 107-2 and IEC 581-12, including: input-output characteristics, linearity distortions, non-linear and intermodulation distortion versus power, frequency, r.f. signal level, S/N (weighted and unweighted), crosstalk, channel separation and switching parameter in stereo tracks.
- electrical parameters of the video track according to the norm IEC 107-1 including: *sensitivity, signal to noise ratio, coefficient of reflection at the antenna input, maximum usable input signal level, video bandpass, selectivity, the \sin^2 and square pulse response, 50 Hz square wave response, group delay characteristics of the luminance and chrominance signal, luminance track nonlinearity.*

4. Testing immunity of electric and electronic equipment to power supply variations .

The Laboratory offers measurements in the following supply conditions: combining of the output voltage and frequency changes with duration time, power line abnormality simulation by fast voltage decrease or fast voltage increase, short pulse simulation in a power line, power supply ON/OFF phase setting, AC voltage superimposed on DC voltage, variable output impedance of power line, voltage drop compensation caused by the output current, the peak of sine wave suppression. Apart of it, it is possible to perform: analysis of harmonic current flowing to the load, peak value and peak holding value of the current flowing to the load measurement.

5. Testing of insulation resistance and dielectric strength.

6. Testing of protective circuits in the devices of first insulation class.

7. Climatic tests.

Products emitting heat and not emitting heat can be tested under the conditions of climatic hazards in the temperature range from -40°C to +85°C and the relative humidity range from 10% to 95% (for the temperature from 10°C to 60°C). There is a possibility of continuous monitoring of two selected points in the DUT. The tests are performed using climate chamber of Heraeus.

Dimensions of test space (WxDxH): 1,5x1,1x2 m.

Dimensions of door (WxH): 0,9x1,9 m.

In all matters related to the activities of the Laboratory please contact:

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