INSTITUTE OF RADIOELECTRONICS

WARSAW UNIVERSITY OF TECHNOLOGY

FACULTY OF ELECTRONICS AND INFORMATION TECHNOLOGY

ANNUAL REPORT

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From the Director

I have pleasure in presenting the Annual Report of the Institute of Radioelectronics. On this occasion, I first of all wish to thank our partners, supporters and friends who contributed towards the accomplishments summarised herein. I also wish to invite other educational, industrial, and commercial institutions to consider prospective collaboration.
This being the fourth edition of the Annual Report, I believe that many of our today's readers may already be familiar with the Institute's goals and activities. What we are always emphasising is the diversity of research fields addressed by our staff and students. For many years we have been involved in the domains of electroacoustics and electromagnetics, nuclear and biomedical engineering, radiocommunications and television, signal processing and monitoring systems.

Such a broad area of expertise gives us flexibility to adapt to the actual requirements and expectations of the industrial and public environment. Thus currently our major research and teaching efforts conform with three themes: Radio Frequency Engineering, Multimedia Technologies, and Biomedical Engineering. Further in this report you will find a summary of our activities and achievements along each of these lines. As an example, let me only refer to the very hot topic of multimedia technologies: a book on the subject, opening of a new multimedia laboratory, and launching a new grant "Virtual laboratory in Internet" can be quoted as our 1998 milestones.

Although in a large part this report enumerates our publications, projects, and courses **-** it has also been our great concern to ensure adequate visibility of teams and individuals behind the listed achievements and tasks The Institute of Radioelectronics comprises excellent staff and (to the contrary of what can be observed in many universities) we have been attracting new distinguished members. We now have 11 professors, well known in Poland and abroad, 38 assistant professors, 11 lecturers and 36 Ph.D. students. They all possess a level of skill, experience, and commitment that ensure providing a curriculum with an educational ideal.

In research, what we strive for is innovative content and technical excellence. Please take a look at our list of publications, and especially 34 journal papers and 69 reports in conference proceedings. Among them, of particular importance are several invited papers, unquestionable proof of international recognition. Three new books, including one published in Japan, provide comprehensive overviews of our contributions to the various domains. Scientific accomplishments of our staff have gained several significant awards, the most prestigious one being Prime Minister's Award for prof. Stefan Hahn, who formally retired but still actively participates in the Institute's research.

Besides R&D and regular teaching duties, the Institute of Radioelectronics has two long-term targets. One is to extend the acceptance and understanding of new technologies by society. The other is to extend the awareness of related challenges and hazards by industry and commerce. Both have been our motivation behind setting up a scheme of courses and part-time studies which in 1998 concentrated on radiocommunications, and covered such topics as GSM/DCS systems or contemporary measuring and controlling systems. Our offer will remain valid and be further developed in subsequent years.

Of several structural changes that have taken place, I would like to bring just one to your attention. The Audio-Visual Equipment Testing Laboratory, originally founded as an independent unit cooperating with other units of the Faculty, has recently been incorporated into the Institute of Radioelectronics. Employees or the Laboratory are experienced specialists in the area of construction and testing of audio-visual equipment, and we are happy to welcome them on board. I hope, the Laboratory will continue to work on its key tasks: measuring technical parameters of general purpose audio-visual equipment, testing effects of climatic hazards, and testing safety of usage of the equipment.

We shall diffuse many copies of this report, and we would highly appreciate your feedback. Please do not hesitate to contact us with questions, comments, and inquiries. For the future, we see the role of an institute like ours more in becoming a forum for exchange and consultations.

Warsaw, April 2004

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

Contents

This Annual Report summaries the research activities of the Institute in 1998, as well as the teaching activities of the academic year 1997/98

1. GENERAL INFORMATION

1.1. Mission of the Institute

Continuously active in the many areas of science, education, and engineering - the Institute of Radioelectronics perceives its long-term mission in bridging the gaps between academia, industry, and society. Its projects are result-oriented. Its teaching is problem-related. Its research serves to identify challenges of newcoming technologies as well as anticipated societal benefits. The main directions of the Institute's works are adapted accordingly.

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 three focal subjects have been decided upon:

- Radio Frequency Engineering,
- Multimedia Technologies,
- Biomedical Engineering.

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. To mention but a few factors, the first multimedia laboratory has been opened, the Computer Laboratory has been renovated and modernised, the Radiocommunication Laboratory has been modernised. Over 10 other laboratories (including Biomedical, and Measuring Systems) are also available to the students.

The coherence between the Institute's offer and the candidates' expectations results in an increasing number of B.Sc., M.Sc. and Ph.D. theses being prepared within the Institute as well as an increasing number of Ph.D. students. Education is supervised by the Institute's experienced staff. 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:

- radiocommunication systems,
- radiolocation antennas,
- television equipment,
- radiomonitoring systems,
- high-efficiency energy sources,
- high-power radio engineering devices,
- equipment for time and frequency services,
- biomedical instrumentation,
- measurement systems.

Thirdly, unique are the facilities available for engineering projects as well as for students' hands-on experience. They comprise an anechoic chamber and a sound studio, a HP ImagePoint, and professional software including QuickWave-3D - winner of the 1998 European Information Technology Prize.

Industrial relevance of the R&D works is ensured by close collaboration with industrial partners. The Institute of Radioelectronics carries out a cooperation 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 other ones.

These industrial and public links are further strengthened by the Institute's involvement in continuing education. The 1998 offer included:

- Part-time Studies on Radiocommunication;
- Postgraduate Courses on Radiocommunication;
- Studies on Audiological Techniques;
- Courses on Measuring and Controlling Systems;
- Course on Fundamentals of GSM/DCS system;
- Course on GSM/DCS phase 2+ cellural system;
- Course on Spectrum monitoring with SMS-7 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. In both research and education, direct cooperation has been developed with many foreign institutions including Université du Quebec a Trois-Rivieres (Canada), Ohio University, University of Waterloo, ZIBJ Dubna (Russia), Forschungs-Gesellschaft für Informationstechnik GmbH (Germany), CERN (Switzerland) and Chalmers University of Technology (Sweden).

1.2. Board of Directors

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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 Devices;
- Microwave Engineering Division;
- Nuclear and Medical Electronics Division.

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

1.3.1. Radiocommunications Division

Head of Division
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Senior academic staff

Adam Fiok, D.Sc.,	Professor
Tomasz Buczkowski, Ph.D.	Assistant Professor
Jacek Cichocki, Ph.D.	Assistant Professor
Krzysztof Czerwiński, Ph.D.	Assistant Professor
Jacek Jarkowski, Ph.D.	Assistant Professor
Wojciech Kazubski, Ph.D.	Assistant Professor (to 8.12.98 - R&D Eng.)
Tomasz Kosiło, Ph.D.	Assistant Professor
Karol Radecki, Ph.D.	Assistant Professor
Waldemar Kiełek, D.Sc.	Associate Professor (emeritus)
Stefan Hahn, D.Sc.	Professor (emeritus)
Henryk Chaciński, M.Sc.	Senior Lecturer (to 30.11.98 - Lecturer)

Junior academic staff

Fahti Ali Alwafie, M.Sc.	Ph.D. Student
Dariusz Janusek, M.Sc.	Ph.D. Student
Błażej Sawionek, M.Sc.	Ph.D. Student
Kajetana Snopek, M.Sc.	Ph.D. Student
Paweł Sokołowski, M.Sc.	Ph.D. Student
Zbigniew Walczak, M.Sc.	Ph.D. Student
Dariusz Grabowski, M.Sc.	Ph.D. Student
Stanisław Maszczyk, M.Sc.	Ph.D. Student

Technical staff
Jerzy Kołakowski, M.Sc. (to 30.09.98 - Assistant)
Stanisław Żmudzin, M.Sc. (0.5)

The teaching activities of the Radiocommunications Division are related to radiocommunication systems and networks, antennas and signal processing, measurement in radiocommunications. Research is focused on specific problems of radiocommunications, such as:
- digital modulations,
- optimising methods of antenna synthesis,
- multidimensional signals theory,
- mobile systems,
- measurements in radiocommunication,
- networks (radio and telecommunications).
- high-frequency measuring systems intended for testing radiocommunication equipment,
- radiomonitoring methods and systems,
- cellular communication systems (GSM, TETRA).
- optimal design of circuits and systems of diagnostics

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 GPS 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
Zdzisław Kozłowski, Ph.D.	Senior Lecturer (0.5)
Jerzy Kondarewicz, M.Sc.	Senior Lecturer ((to 31.03.98 - Lecturer)
Marek Rusin, Ph.D.	Assistant Professor (0.5)

Junior academic staff

Tomasz Krzymień, M.Sc.	Lecturer (to 30.9.98 - Assistant)
Jacek Marzyjanek, M.Sc.	Assistant
Jakub Gabryś, M.Sc.	Ph.D. Student
Grzegorz Galiński, M.Sc.	Ph.D. Student
Dariusz Grzęda, M.Sc.	Ph.D. Student
Krystian Ignasiak, M.Sc	Ph.D. Student
Krzysztof Kurek, M.Sc	Ph.D. Student
Krzysztof Mroczek, M.Sc.	Ph.D. Student

Wojciech Sadowski, M.Sc.	Ph.D. Student
Adam Pietrowcew, M.Sc.	(from 1.10.98)
Maciej Łempkowski, M.Sc.	(from 1.12.98)

Technical staff
Tomasz Smakuszewski, M.Sc.

Television Division conducts scientific and applied research in the area of terrestrial, satellite and cable television systems, analogue and digital components of television systems, broadcasting equipment as well as digital image processing. A new group has started intensive activities in the multimedia area. Specific research topics in 1998 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

Andrzej Leszczyński, Ph.D.,	Assistant Professor
Ewa Kotarbińska, 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 (from 15.9.98 on the leave)
Radosław Smoliński, M.Sc.	Ph.D. Student
Piotr Nykiel, M.Sc.	Ph.D. Student

The activities of the Division concern audioacoustics and ultrasonic techniques including investigations, measurements, and applications. They are focused on:

- 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.
- digital audio

Current research topics include:

- 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.

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

1.3.4. Radio Engineering Division

Head of Division
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Senior academic staff

Roman Z. Morawski, D.Sc.	Professor
Konrad Adamowicz, Ph.D.	Assistant Professor (0.5)
Mirosław Mikołajewski, Ph.D.	Assistant Professor
Juliusz Modzelewski, Ph.D.	Assistant Professor
Andrzej Podgórski, Ph.D.	Assistant Professor
Krzysztof Puczko, Ph.D.	Senior Lecturer (0.5) (As. Prof. - on the leave)
Wiesław Winiecki, Ph.D.	Assistant Professor
Andrzej Miękina, Ph.D.	Assistant Professor (to 20.12.98 - Assistant)

Junior academic staff

Robert Łukaszewski, M.Sc.	Assistant
Piotr Kluk, M.Sc.	Ph.D. Student
Cezary Niedziński, M.Sc.	Ph.D. Student
Adam Osytek, M.Sc.	Ph.D. Student
Tomasz Szafrański, M.Sc.	Ph.D. Student
Nguyen Lien Huong, M.Sc.	Ph.D. Student(to 30.4.98)
Piotr Sprzęczak, 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 Rosłoniec, D.Sc.	Professor
Małgorzata Celuch-Marcysiak, Ph.D.,	Assistant Professor
Krzysztof Kowalski, Ph.D.	Assistant Professor (0,5)
Przemysław Miazga, Ph.D.	Assistant Professor
Maciej Sypniewski, Ph.D.	Assistant Professor
Andrzej Więckowski, Ph.D.	Assistant Professor
Wojciech Wojtasiak, Ph.D.	Assistant Professor (to 30.4.98 - Senior Lect.)
Jolanta Zborowska, Ph.D.	Assistant Professor
Krzysztof Robaczyński, M.Sc.	Senior Lecturer (0.5)

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
Witold Mizera, M.Sc.	Ph.D. Student
Phan Than Bang, M.Sc.	Ph.D. Student
Konrad Szustak, M.Sc.	Ph.D. Student

Technical staff

Krzysztof Kowalski, Ph.D.	(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 1998 included:

- design of high-frequency systems for telecommunication and radiolocation (generators, synthesisers, modulators, amplifiers, antennas),
- methods of synthesis and computer-aided design of passive and active microwave circuits (couplers, summators and dividers, switches, transistor circuits),
- design of modern computer-aided measuring systems (network analysers, power and frequency meters, specialised systems for microwave diode and transistor measurements), and development of their hardware and software components,
- development of numerical methods and implementation of computer programs 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.

1.3.7. Nuclear and Medical Electronics Division

Head of Division

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Senior academic staff

Adam Piątkowski, D.Sc.	Professor
Piotr Brzeski, Ph.D.	Assistant Professor
Tomasz Jamrógiewicz, M.Sc.	Senior Lecturer (0.5)
Piotr Bogorodzki, Ph.D.	Assistant Professor (to 30.9.98 - Assistant)
Marek Karolczak, Ph.D.	Assistant Professor (on the leave from 16.6.97)
Marian Kazubek, Ph.D.	Assistant Professor
Bogumił Konarzewski, Ph.D.	Assistant Professor (to 20.12.98 - Assistant)
Janusz Marzec, Ph.D.	Assistant Professor
Jacek Mirkowski, Ph.D.	Assistant Professor
Lech Padee, Ph.D.	Senior Lecturer (0.33) (Ass. Prof. - on the leave)
Artur Przelaskowski, Ph.D.	Assistant Professor
Waldemar Smolik, Ph.D.	Assistant Professor (to 31.1.98 - Senior Administrative Assistant)
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 (to 30.09.98 - R&D Eng.-0.5, Lect.-0.5)
Ewa Piątkowska-Janko, M.Sc.	Lecturer (0,9)
Grzegorz Domański, M.Sc.	Ph.D. Student
Jarosław Wasielewski, M.Sc.	Ph.D. Student

Technical and administrative staff

Dariusz Ćwiek, M.Sc.	(on the leave)
Tomasz Jamrógiewicz, M.Sc.	(0.5)
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 the vector space transformations for improving the quality of ECG recorded signals,
- multimodal imaging of topographic, tomographic and functional studies in medicine,
- correlative 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-); Ministry of National Education Awards in Research (1997); [Edu71]; [Pro10], [Pro26]; [Rep35].

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Piotr A. Brzeski
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Małgorzata Celuch-Marcysiak
M.Sc. ('88),Ph.D. ('96); microwaves; Assistant Professor, Microwave Engineering Division; Head of the student laboratory Fields and Waves; reviewer for IEEE Transactions on MTT and IEEE Transactions on AP; Ministry of National Education Award in Research (‘95); Scholarship of the Foundation for Polish Science (‘96); Rector’s Award in Research (‘97); Member of the team winning the European Information Technology Prize (’98); [Edu18[, [Edu48], [Edu80], [Edu85]; [Pro27]; [Pub55], [Pub56], [Pub57], [Pub58], [Pub59], [Pub60], [Pub125], [Pub126], [Pub127]; [Rep6]; [Con4], [Con7], [Con11], [Con23], [Con40], [Con43].

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M.Sc. Electronics ('66), M.A. Mathematics ('75), Ph.D. ('76), D.Sc. ('89). Signals and Systems, Computer Aided Design, Graphs and Networks, Diagnostics, Mathematical Methods in Engineering. Professor (93'-), Chairman of Radiocommunication Division. Head of the interfaculty research group on networks and discrete optimization. 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 Optymalization; Coordinator of the cooperation agreement between WUT and University of Waterloo, Canada and WUT and Ohio University; [Edu36], [Edu87], [Edu101]; [Pro3], [Pro33], [Pro38]; [Pub22], [Pub23], [Pub24], [Pub48], [Pub49], [Pub52], [Pub80]; [Con27].

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Wojciech Wojtasiak
M.Sc. ('84); microwave technique; Senior Lecturer ('96), Microwave Engineering Division; Head of the student laboratory of Microwave Technology; [Edu16]; [Pro11], [Pro14], [Pro28], [Pro43], [Pro53], [Pro58], [Pro59]; [MSc16], [MSc26]; [Pub104], [Pub113], [Pub114], [Pub115], [Pub116], [Pub117], [Pub118]; [Rep6], [Rep26]; [Con29].

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Krzysztof Zaremba
M.Sc. ('81), Ph.D. ('90); nuclear and medical electronics; Assistant Professor, Nuclear and Medical Electronics Division; Member of the Dean's Committee for Awards and Distinctions ('91-'96); Member of FEIT Joint Admission, Undergraduate and Graduate Committee ('91-); Unpaid Associate of CERN ('89-); Faculty Coordinator of SOCRATES Programme (1997-); [Edu72], [Edu99]; [Pro12], [Pro61]; [Pub17], [Pub18], [Pub19], [Pub20], [Pub25], [Pub27], [Pub29]; [Rep15], [Rep16], [Rep27].

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Jolanta Zborowska
M.Sc. ('74), Ph.D. ('83); microwave technique; Assistant Professor ('83-), Microwave Engineering Division; [Edu76]; [Pro14], [Pro28], [Pro43]; [MSc3], [MSc18], [MSc33], [MSc59]; [Rep26].

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2.2. Junior academic staff

Tomasz Krzymień, M.Sc.	Lecturer (to 30.9.98 - Assistant) *phone: 660-7795*
Robert Łukaszewski, M.Sc.	Assistant *phone: 660-7340*
Jacek Marzyjanek, M.Sc.	Assistant *phone: 660-5476*
Tomasz Olszewski, M.Sc.	Lecturer (to 30.09.98 - R&D Eng.-0.5, Lect.-0.5) *phone: 660-7577*
Jan Paluchowski, M.Sc.	Assistant (on the leave) *phone: 660-7637*

Ewa Piątkowska-Janko, M.Sc.	Lecturer (0,9) (to 30.9.98 - Assistant) *phone: 660-7918*
Fathi Ali Alafie, M.Sc.	Ph.D. Student
Mirosław Andrzejewski, M.Sc.	Ph.D. Student
Phan Than Bang, M.Sc.	Ph.D. Student (to 31.12.98)
Dariusz Bednarczyk, M.Sc.	Ph.D. Student
Piotr Bobiński k, 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
Dariusz Górlicki, M.Sc.	Ph.D. Student
Dariusz Grabowski, M.Sc.	Ph.D. Student
Daniel Gryglewski, M.Sc.	Ph.D. Student
Dariusz Grzęda, M.Sc.	Ph.D. Student (to 30.09.98)
Nguyen Lien Houng, M.Sc.	Ph.D. Student (to 30.04.98)
Krystian Ignasiak, 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
Maciej Łempkowski, M.Sc.	Ph.D. Student
Stanisław Maszczyk, M.Sc.	Ph.D. Student
Ryszard Michnowski, 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
Adam Pietrowcew, M.Sc.	Ph.D. Student
Wojciech Sadowski, M.Sc.	Ph.D. Student
Błażej Sawionek, M.Sc.	Ph.D. Student
Radosław Smoliński, M.Sc.	Ph.D. Student
Paweł Sokołowski, M.Sc.	Ph.D. Student
Kajetana Snopek, M.Sc.	Ph.D. Student
Piotr Sprzęczak, M.Sc.	Ph.D. Student
Tomasz Szafrański, 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
Tomasz Wolak, M.Sc.	Ph.D. Student
Zbigniew Walczak, M.Sc.	Ph.D. Student

2.3. Technical and administrative staff

Marta Bukowska-Korol, M.Sc.	R&D Engineer, (0.25) (to 31.08.98) *phone: 660-7955*
Janina Chmielak	Senior Technician *phone: 660-7479*
Dariusz Ćwiek, M.Sc.	Senior Development Enginner (on the leave) *phone: 660-7577*
Marianna Foriańczyk	Secretary (from 1.08.98) *phone:660-7233,8253929*
Janina Gałęcka	Senior Accountant *phone: 660-7645*
Wiesława Garbowska	Senior Accountant (to 16.06.98) *phone: 660-7645*
Tomasz Jamrógiewicz, M.Sc.	Senior R&D Engineer-0.5 *phone: 660-7917*
Jerzy Kołakowski, M.Sc.	R&D Engineer (to 30.9.98 - Assistant) *phone: 660-7635*
Krzysztof Kowalski, Ph.D.	Senior R&D Engineer-0,5 *phone: 660-7626*
Maciej Konwicki, M.Sc.	Head R&D Engineer *phone:660-7233,8253929*
Bogdan Kwiatkowski, M.Sc.	Senior R&D Engineer *phone: 660-5367*
Andrzej Laskowski	Worker (from 1.04.98) *phone: 660-7957*
Ryszard Leoniak, M.Sc.	Senior R&D Engineer *phone: 660-7946*
Mirosław Lubiejewski	Foreman *phone: 660-7633*
Teresa Miąsek, M.Sc.	Curator of the Library *phone: 660-7627*
Danuta Morawska	Secretary *phone:660-7829,8255248*
Helena Oleksak	Section Manager *phone:660-7957,8253769*
Andrzej Owczarek, M.Sc.	Senior Development Engineer *phone: 660-7793*
Małgorzata Pacak	Secretary *phone:660-7829,8255248*
Anna Pietras	Senior Accountant (from 8.10.98) *phone: 660-7645*
Andrzej R. Podgórski, M.Sc.	Senior R&D Engineer *phone: 660-5367*
Stanisław Pyzlak	Senior Foreman *phone: 660-7378*
Krzysztof Robaczyński, M.Sc.	Senior R&D Engineer *phone: 660-7622*
Andrzej Skrzypkowski	Foreman *phone: 660-7378*
Tomasz Smakuszewski, M.Sc.	R&D Engineer *phone: 660-7840*
Kajetana Snopek, M.Sc.	Administrative Assistant (on the leave) *phone: 660-7479*
Hanna Szot	Accountant *phone: 660-7743*
Anna Tratkiewicz	Secretary *phone:660-7233,8253929*
Andrzej Wasilewski	Worker *phone: 660-7919*
Joanna Witkowska	Senior Technician *phone:660-7955,8251363*
Stanisław Żmudzin, M.Sc.	Senior R&D Engineer -0.5 *phone: 660-7635*

3. TEACHING ACTIVITIES (academic year 1997/98)

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; M. Karolczak.

[Edu3] *Electronic Medical Instrumentation - Lab*. (Elektroniczna aparatura medyczna - EAME); 4h/week; elective; L. Padee.

Materials,Components,Design
[Edu4] (Materiały, elementy i konstrukcje - MEIK); 1h/week, K. Radecki, J. Cichocki (tabs - only)

[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; A. Buchowicz.

[Edu9] *Orientation 3* (Orientacja 3 - OR3); 1h/week; semester 3; E. Piątkowska-Janko.

[Edu10] *Orientation 4* (Orientacja 4 - OR4); 1h/week; semester 4; R. Szabatin.

[Edu11] *Orientation 5* (Orientacja 5 - OR5); 1h/week; semester 5; M. Tajchert, J. Marzec.

[Edu12] *Orientation 6* (Orientacja 6 - OR6); semester 6; P. Brzeski.

[Edu13] *Orientation 6* (Orientacja 6 - OR6/IPE); 1h/week; semester 6; J. Wojciechowski.

[Edu14] *Basics of Electroacoustics* (Podstawy elektroakustyki - PEA); 3h/week; semester 6; A. Leszczyński, J. Narkiewicz-Jodko.

[Edu15] *Basics of Computer Technique* (Podstawy techniki komputerowej - PTKO); 4h/week; semester 1; A. Więckowski.

[Edu16] (*Basics of High Frequency Technique - Lab.* (Podstawy techniki w.cz. - TWCZ); 2h/week; semester 4; W. Wojtasiak.

[Edu17] *Basics of Television* (Podstawy telewizji - PT); 3h/week; semester 6; Z. Kozłowski.

[Edu18] *Fields and Waves* (Pola i fale - POFA); 3h/week; semester 3; T. Morawski, W. Gwarek.

[Edu19] *Programming* (Programowanie - PROG); 5h/week; semester 2; A. Podgórski.

[Edu20] *Programming 2* (Programowanie 2 - PROG2); 3h/week; semester 5; P. Błociszewski.

[Edu21] *Operating Systems* (Systemy operacyjne - SOP); 3h/week; semester 5; M. Sypniewski.

[Edu31] *Measuring Systems* (Systemy pomiarowe - SPOM; 6h/week; semester 5; W. Winiecki.

[Edu32] *Measuring Systems* I (Systemy pomiarowe I-SPOM; 4h/week; semester 5; W. Winiecki.

[Edu33] *Measuring Systems* II (Systemy pomiarowe II-SPOM; 4h/week; semester 6; W. Winiecki.

[Edu34] *Microprocessor Techniques* (Podstawy techniki mikroprocesorowej - TMIK); 4h/week; semester 5; K. Czerwiński.

[Edu35] *Computer Networks* (Sieci komputerowe - SKP1); 1h/week; semester 5 J. Marzec

[Edu36] *Signals and Systems* (Sygnały i Systemy - SYS/ISE); 4h/week+laboratory; semester 3; J.Wojciechowski.

[Edu37] *Theory of Signals and Modulations* (Teoria sygnałów i modulacji - TSIM); 3h/week; semester 4; T. Kosiło, K. Radecki.

3.2 Advanced courses

[Edu38] *Environmental Acoustic* (Akustyczna ochrona środowiska - AOS); 3h/week; E. Kotarbińska.

[Edu39] *Measured Data Analysis*(Analiza danych pomiarowych w medycynie - ADP); 3h/week; Z. Pawłowski.

[Edu40] *Analysis and Synthesis of Microwave Circuits* (Analiza i synteza układów mikrofalowych - ASUM); 3h/week; S. Rosłoniec.

[Edu41] *Semantic analysis of images and sounds* (Analiza semantyczna obrazu i dźwięku - ASOD); 3h/week; W. Skarbek.

[Edu42] *Ultrasonography Instrumentation* (Aparatura ultrasonograficzna - AUS); 3h/week; L. Padee.

[Edu43] *Biophysic* (Biofizyka - BF); 3h/week; J. Doroszewski

[Edu44] *Digital Data Transmission* (Cyfrowa transmisja informacji - CTIN); 3h/week; T. Buczkowski, T. Kosiło.

[Edu45] *Digital Processing* of Measurement Signals (Cyfrowe przetwarzanie sygnałów pomiarowych - CPSP); 3h/week; R.Z.Morawski.

[Edu46] *Biomedical Signal - Processing* (Cyfrowe przetwarzanie sygnałów biologicznych - CPSB); 4h/week; W. Wierzejski.

[Edu47] *Digital Circuits* (A13); 2h/week; P. Miazga

[Edu48] Electromagnetic Compatibility (Kompatybilność elektromagnetyczna - KE); 2h/week; W. Gwarek

[Edu49] *Radioelectronics Laboratory* (Laboratorium radioelektroniki - LR); 4h/week; semester 8; J. Modzelewski, J. Cichocki, J. Kołakowski

[Edu50] *Antennas and Radiowave Propagation* (Anteny i propagacja fal - AIPF); 3h/week; elective; J. Jarkowski.

[Edu51] *Ecological and Health Aspects of Electronics* (Aspekty ekologiczne i zdrowotne elektroniki - AZE); 3h/week; elective; T. Buczkowski.

[Edu52] *Digital Measurements - Lab.* (Cyfrowa technika pomiarowa - CTPL); 2h/week; elective; A. Podgórski.

[Edu53] *Digital Image Processing* (Cyfrowe przetwarzanie obrazów - CPOO); 4h/week; elective ; M. Kazubek.

[Edu54] *Programmable Digital Systems* (Cyfrowe układy programowalne - CUP); 5h/week; elective; T.Buczkowski, K. Czerwiński, T. Olszewski.

[Edu55] *Loudspeakers and Loudspeaker Enclosures* (Głośniki i obudowy głośnikowe - GOG); 2h/week; elective; J. Narkiewicz-Jodko.

[Edu56] *Data Compression 2* (Kompresja danych 2 - KODA2); 3h/week; elective; A. Przelaskowski.

[Edu57] *Electroacoustics A - Lab.* (Laboratorium elektroakustyki A - EAAL); 2h/week; elective; J. Narkiewicz-Jodko.

[Edu58] *Methods and Algorithms for Processing Measurement Signals* (Metody i algorytmy przetwarzania sygnałów pomiarowych - MAP); 3h/week; elective; R. Z. Morawski.

[Edu59] *Methods and Equipment for Organ Structure Visualisation* (Metody i urządzenia do wizualizacji struktur narządowych - MWSN); 3h/week; elective; R. Szabatin.

[Edu60] *Radioelectronic Measurements* (Miernictwo radioelektroniczne - MR); 3h/week; elective; A. Fiok, J. Cichocki.

[Edu61] *Noise Control* (Ochrona przed hałasem); 2h/week; E. Kotarbińska

[Edu62] *Sound Recording and Forming* (Odbiór i kształtowanie dźwięku - OKD); 3h/week; elective; M. Tajchert.

[Edu63] *Programming of Medical Systems* (Oprogramowanie systemów medycznych OSM); 3h/week;elective; P.Błociszewski.

[Edu64] *Measuring Systems Software* (Oprogramowanie systemów pomiarowych - OSP); 4h/week; elective; W.Winiecki.

[Edu65] *Basics of Radiocommunications* (Podstawy radiokomunikacji - PRR); 3h/week; elective; T. Kosiło.

[Edu66] (Podstawy radiolokacji i nawigacji - PRIR); 3h/week, S. Rosłoniec.

[Edu67] *Basics of multimedia techniques* (Podstawy technik multimedialnych - PTMU); 3h/week; W. Skarbek.

[Edu68] *Principles of Medical Imaging Techniques* (Podstawy technik obrazowania w medycynie - PRIR); 4h/week; P. Brzeski.

[Edu69] *Mobile Radio Communication* (Radiokomunikacja ruchoma lądowa - RRL); 3h/week; elective; T. Kosiło.

[Edu70] *GSM System* (System telefonii komórkowej GSM); 2h/week; elective; J. Cichocki,J.Kołakowski

[Edu71] *System Measuring and Controlling Devices* (Systemowe urządzenia pomiarowe i sterujące - SUPS); 4h/week; elective; K. Adamowicz.

[Edu72] *Artificial Neural Networks in Medicine* (Sztuczne sieci neuronowe w medycynie - SESN2); 3h/week; elective; K. Zaremba.

[Edu73] *Signal Transmitting and Receiving* (Technika nadawania i odbioru - TNO); 2h/week; elective; J. Ebert.

[Edu74] *Cable Television* (Telewizja przewodowa - TVP2); 3h/week; elective; J. Modelski.

[Edu75] *Satellite Communication* (Łączność satelitarna - ŁS); 3h/week; elective; J. Modelski.

[Edu76] *Techniques Microwave* (Technika mikrofalowa - TMO); 3h/week, J. Zborowska

[Edu77] *Techniques of a television receiving* (Technika odbioru telewizyjnego - TOT); 3h/week, M. Rusin

[Edu78] *Radio Transmitting Technique and its Applications* (Technika nadawania radiowego i jej aplikacje - TNR); 4h/week; J. Modzelewski, M. Mikołajewski.

[Edu79] *Nuclear Medicine Techniques* (Techniki medycyny nuklearnej - TNN); 4h/week, R. Szabatin.

[Edu80] *Electromagnetic Field Theory* (Teoria pola elektromagnetycznego - TPE); 4h/week, T. Morawski.

[Edu81] *Computed Tomography* (Tomografia komputerowa - TOM); 4h/week, J. Mirkowski

[Edu82] *Digital Circuits - Lab.* (Układy logiczne - UKLO); 2h/week; semester 4; P. Miazga.

[Edu83] *Data Transmission in Computer Systems* (Transmisja danych w systemach komputerowych - TDSK); 3h/week; elective; T. Buczkowski.

[Edu84] *Contemporary Applications of Microwaves* (Współczesne zastosowania mikrofal - WZN); 3h/week; elective; J. Modelski.

[Edu85] *Analysis of Electromagnetic Fields* (Metody analizy pól elektromagnetycznych - MAPE); 3h/week; Ph.D. studies; T. Morawski, W. Gwarek.

[Edu86] *Radio Networks and Systems* (Sieci i systemy radiowe - SSR); 3h/week; K. Puczko.

[Edu87] *Graphs and Networks* (Grafy i Sieci - GIS); 4h/week; J. Wojciechowski.

3.3. Courses for part-time studies on Radiocommunication

[Edu88] *Basics of Computer Techniques* (Podstawy Techniki Komputerowej - PTKR); 70h/sem.; semester 1; J. Marzec

[Edu89] *Basics of Metrology* (Podstawy Metrologii - PMER); 40h/sem.; semester 1; W. Winiecki.

[Edu90] *Fields and Waves* (Pola i fale - PFR); 72h/sem.; semester 2; T. Morawski.

[Edu91] *Numerical Methods* (Metody Numeryczne - MNR); 35h/sem.; semester 3; S. Rosłoniec.

[Edu92] *Basics of High Frequency Techniques* (Podstawy Techniki w.cz. - PTWR); 65h/sem.; semester 3; K. Kowalski.

[Edu93] *Programming* (Programowanie - PMR); 32h/sem.; semester 3; W. Smolik.

3.4. Special courses

Courses on Radiocommunication, Electroacoustics and Medical Engineering (RADEM)

[Edu94] *Contemporary Measuring and Controlling Systems* (Współczesne systemy pomiarowo-kontrolne); 40h; W. Winiecki

[Edu95] *Introduction to GSM/DCS system* (Wstęp do systemu GSM/DCS); (4x8h); J. Cichocki, T. Kosiło, J. Kołakowski.

[Edu96] *Fundamentals of GSM/DCS* -system (Podstawy systemu GSM/DCS); (10x16h); J. Cichocki, K. Radecki, T. Kosiło, J. Kołakowski.

[Edu97] *GSM/DCS phase 2+ - cellural system* (Podstawy systemu telefonii komórkowej GSM/DCS - faza 2+); (3x24h); J. Cichocki, J. Kołakowski, T. Kosiło, K. Radecki.

[Edu98] *Spectrum monitoring with SMS-7 system* (Monitorowanie widma za pomocą systemu SMS-7); (4x42h) ; J. Cichocki, J. Kołakowski.

3.5. International co-operation

[Edu99] TEMPUS MJEP-9006: **„Courses and Projects for Students in Pure and Applied Physics"**
Z. Pawłowski, Prof., D.Sc., (1995-1996),
K. Zaremba, Ph.D., (1996-1998),
Z. Pawłowski;
1995-1998

Organisation of efficient mobility network for students of different universities, related to pure and applied physics, is the main goal of the project. In the frame of the project courses and training for academic staff are also organised. The link between universities and Swedish enterprises, engaged in research on technical applications of physics, has been created.

[Edu100] TEMPUS JEP-11117-96: **„The Interdisciplinary 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 programs, video tapes;
- acquiring of visualisation workstation, network equipment, and specialised hardware for real time processing, and upgrading of magnet hardware.

[Edu101] TEMPUS JEP-9023-95: **Education in Signal Processing and Circuits for Signal Processing** (Nauczanie w zakresie przetwarzania sygnałów i obwodów do przetwarzania sygnałów).
J. Wojciechowski, Prof., D.Sc.,
J.Zarzycki, A. Davies, R. Nonta
1995 - 1998

The strategic goal of the project was to prepare means for developing human resouces with up-to-date training in the fields of signals processing and circuits for signal processing.

4. RESEARCH PROJECTS

4.1. Projects granted by the University

Statutory projects

[Pro1] **Problems and methods of TETRA mobile station measurements** (Problemy i metody pomiaru parametrów radiowych stacji ruchomych systemu TETRA).
Adam Fiok, Prof.,D.Sc.,
J. Cichocki, J. Kołakowski, S. Żmudzin
5.06.97 - 30.04.98

The project concerns technical aspects of TETRA mobile stations measurements. It has been focused on to topics:
- analysis of system features,
- recognition needs and problems connected with the testing of TETRA mobiles.

A report contains a description of most important tests and the view of commercially available instrumentation is included, equipment features have been analyzed and briefly described . The result of the project will be used in didactic activity of research team members There is a need for further investigation in this field because this system will be implemented in Poland in the nearest future and there is no dominant research center in Poland dealing with these topics.

[Pro2] **Selected Problems on Data Radio Transmission** (Radiowa transmisja danych)
Jacek Jarkowski, Ph.D.
T. Buczkowski, H. Chaciński, K. Czerwiński, W. Kiełek, T. Kosiło, K. Radecki
5.06.97 - 30.04.98

- Timing accuracy investigation of the scintillation counter equipped with the constant-fraction discriminator.
- Longtime gravity force changing investigation in Astronomic and Geodesic Observatory in Jozefoslaw.
- New chart research.
- The gravimeter measurements accuracy analysis.
- The aspects of the data radio transmission in computer systems

[Pro3] **Diagnosis of analog engineering systems.** (Diagnostyka złożonych analogowych systemów inżynierskich).
Jacek Wojciechowski, Prof.,D.Sc.,
W. Brygilewicz
5.06.97 - 30.04.98

A unified method for testing analog systems built either of homogenous or mixed (i.e. exploiting different physical phenomena) blocks has been proposed and tested. The results of the research can be found in : V.Brygilewicz, J.Wojciechowski, Diagnosis of Analog Multi-phenomena Systems, Bulletin of the Polish Academy of Sciences, Technical Sciences, Vol. 46, No.4, 1998, pp. 487-499.

[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.,
Z. Kozłowski, A. Buchowicz, T. Smakuszewski, J. Kondarewicz, T. Krzymień, J. Marzyjanek
5.06.97 - 30.04.98

New version of remote controller for TV equipment software for edge detection for digital images. Software for decreasing redundante information using wavelets.

[Pro5] **Pattern Recognition by Invariant Reference Points** (Punkty referencyjne w rozpoznawaniu obiektów).
Władysław Skarbek, Prof.,D.Sc.,
K. Ignasiak
5.06.97 - 30.04.98

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.

[Pro6] **The new method for identification of modes in resonant inhomogeneously filling structures** Nowa metoda identyfikacji rodzajów drgań w strukturach rezonansowych o niejednorodnym wypełnieniu).
Krzysztof Derzakowski, Ph.D.
J. Modelski
5.06.97 - 30.04.98

The work results in few computer program for computation and visualisation of electromagnetic field distribution in resonant structures contain isotropic and anisotropic materials as well as a new method for identification of modes. The radial mode matching method as the most accurate for this purpose has been used for the computation of field components. The elaborated method of a mode identification can be used in many applications of higher modes in resonant structures. The paper on the EuMC'98 have been written on the base of results of the work.

[Pro7] **System of sound recording and studio production** (Laboratoryjny system do nagrań i obróbki dźwięku).
Andrzej Leszczyński, Ph.D.
M. Tajchert, J. Paluchowski, A. Aronowski
5.06.97 - 30.04.98

The work presents the second stage of the project of the sound studio, located at the Department of Electroacoustics, equiped with multitrack digital system for sound recording and processing. The results of the detailed investigations of the acoustical parameters of the studio after reconstruction by means of the pulse method and computer simulation, has been presented. The farther works on developement of the control room (analog and digital hardware) were employed. As a result, preliminary recordings were realized.

[Pro8] **Optimization of high - frequency resonant Class - D power amplifiers** (Optymalizacja rezonansowych wzmacniaczy mocy wielkiej częstotliwości klasy D).
Jan Ebert, Prof.,D.Sc.,
M. Mikołajewski, J. Modzelewski, A. Owczarek
5.06.97 - 30.04.98

The purpose of the project was an analysis of phenomena in the gate circuits of MOSFET transistors in Class - D power amplifiers. The Miller's effect accuring in the gate circuits of the transistors can significantly decrease their imput impedance during switching intervals. This, in turn, distorts waveforms of transistor gate voltages disturbing the operation of the whole Class - D amplifier and decreasing its efficiency as well as its power output capability. The influence of the Miller's effect on the operation of the basic Class - D_u amplifier was analised. It was shown that this effect can be eliminated in the modified Class - D_u amplifier so-called Class - D_u - ZVS (zero voltage switching) amplifier. The theoretical results were verified experimentally.

[Pro9] **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. Szafrański
5.06.97 - 30.04.98

The main objectives of the project were as follows: the design and implementation of new algorithms for calibration of measurement channels and reconstruction of measurands, the design of procedures for analysis of accuracy of those algorithms, as well as the upgrading the computer-system infrastructure of research laboratories. The design methodology involved the use of the *MATLAB* package, or synthetic and real-world measurement data, for designing and investigating the algorithms for measurement data processing. The MATLAB *Fuzzy Logic Toolbox* was used, in particular, for designing four procedures for accuracy analysis of the algorithms for measurement data processing, the *Optimization Toolbox* was used for studying spline-based algorithms of static calibartion and designing telemetric systems for civil construction monitoring. The results were published in three conference papers.

[Pro10] **Methods of measuring systems designing and analysis** (Metody projektowania i analizy systemów pomiarowych).
Wiesław Winiecki, Ph.D.
K. Adamowicz, R. Leoniak, P. Łukaszewski
5.06.97 - 30.04.98

The use of the *MATLAB* package for designing measuring systems was considered. An acoustic measuring system was designed using MATLAB. An analysis of the possibility of application the MATLAB for this purpose, in comparison with other software packages, was described. Systematic arrangement of concepts related to virtual instruments was presented. A methodology for designing virtual instruments using integrated software environments LabWindows/CVI, LabView and HP VEE was work out.

[Pro11] **Modelling and Design of Passive, Active and Radiating Microwave Circuits** (Modelowanie i projektowanie pasywnych, aktywnych i promieniujących układów mikrofalowych).
Tadeusz Morawski, Prof.,D.Sc.,
W. Gwarek, W. Wojtasiak, K. Kowalski,
5.06.97 - 30.04.98

The research works are concentrated on five subjects:

a) *Modelling of ridged circular waveguides.*
Possibilities of modelling of CRW components with the conformal finite difference time domain method have been addressed. The method has been shown to ensure competitive accuracy and computational efficiency in the analysis of eigenmodes. In particular, degenerate modes are correctly distinguished even at coarse discretization. For the modelling of deterministic problems, a novel algorithm for matched termination of the conformal FDTD mesh has been proposed. Field filtering through the conformal modal templates has been suggested, and its effects on the accuracy of S-parameter extraction in CRW components has been studied.

b) *Microwave Circuits Design for Radiolocation*
At the Institute of Radioelectronics of The Warsaw University of Technology are carried out research over microwave power amplifiers. Recenly the 45W power amplifier for L band T/R module has been designed. Accounting for signal low distortions "class A" linear amplifier configuration, with silicon, bipolar transistor (LFE15600 PHILIPS) , has been selected. The obtained parameters are:Gain 11dB and P_{1dB} = 46.5 dBm. It is a development of 15 W of amplifier worked out previously.

e) The Microwave High Stability Syntetizers and Osscilators Design
For the last few years fast development of microwave synthesizers for high stability carrier has been spot-ted. They are widely applied in telecommunication and radiocommunication systems, wherever modulated signal (for example FM and AM modulated) on micro-wave frequencies is transmitted. In this case efficie-ncy of signal source is not so important. The most important thing is to obtain high frequency stability and low power level of phase noise. At the Institute of Radioelectronics of Warsaw University of Technology research over this synthesizer have been carried out. The flexible architecture of synthesizer has been prepared. The architecture permits to construct synthesizers for arbitrary microwave frequency bands.

[Pro12] **Radiation Methods in Medical Technique** (Metody radiacyjne w technikach medycznych).
Zdzisław Pawłowski, Prof.,D.Sc.,
A. Piątkowski, 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. Przelaskowski,
W. Smolik, J. Wasielewski, A. Wasilewski,
K. Zaremba
5.06.97 - 30.04.98

a) Scintillation sensor for digital radiography of bone.

Linear scintillation sensor for bone density measure-ments has been constructed. Sensor consists of luminophore, 64 fiber optics and photodiodes coupled to electronic system. The properties of sensor have been investigated. The sensitivity and uniformity response for X-rays have been measured.

b) AuAutomation of MR tomograph magnetic field measurement and shimming by RS-485 local area network.

Modern MR scanners put strong demands on magnetic field homogeneity. The desirable value of this parameter should be better than 10 ppm. Due to strong influence of

field inhomogeneities on the measured values the process of field correction must sometimes be iterative. The system consisting of 8-channel 12-bit digital to analog converter and and 7-channel low noise RF multiplexer has been developed. Taking advantage of industry standard RS485 based network it is possible to do magnetic field inhomogeneity measurements from the PC-based station with almost no intervention from the operator.

Projects granted by the Rector

[Pro13] **An analysis and optymalization of h.f. synchronous regulators** (Analiza i optymalizacja układów regulatorów synchronicznych wielkiej częstotliwości).
Mirosław Mikołajewski, Ph.D.
14.05.97 - 31.05.98

Output power control is an important issue in high-frequency power circuits. The used method of output power control in a high-frequency power circuit can often decide about circuit parameters and consequently about the scope of circuit applications. One of the latest methods of output power control utilises h.f. synchronous regulators. The aim of the project was an analysis and optimisation of novel h.f. synchronous regulators. Results of the analysis were used in a design procedure for power circuits with synchronous regulators. Laboratory models of high-frequency power circuits with a Class E amplifier and synchronous regulators were built and tested. They operated at a constant frequency.

[Pro14] **Design of disspersive nonuniform and coupled lines for microwave phase modulators** (Projektowanie dyspersyjnych linii niejednorodnych i sprzężonych do mikrofalowych madulatorów fazy).
Tadeusz Morawski, Prof.,D.Sc.,
J. Zborowska, W. Wojtasiak, D. Gryglewski, R. Michnowski, M. Kukier
14.05.97 - 31.05.98

In the microwave telecommunication systems, radiolocation and measurement systems transmission type or reflection type phase modulators are widely used. The methods of design of classical coupled disperssive lines and proposed, (new, simple to construct) nonuniform lines were the subject of works as well as investigations of phase modulators employing SPDT switches. The computer programs for design of nonuniform strip-lines and nonuniform fin-lines were elaborated. These lines were used both in transmission types and reflection types phase modulators. Good experimental results of practical investigation of several modulators have been obtained. The results were utilized in doctor thesis of W. Wojtasiak.

[Pro15] **Hybrid Correction of Magnetic Field Inhomogeneities for Magnetic Resonance Imaging Purposes** (Hybrydowa metoda korekcji niejednorodności pola głównego dla potrzeb tomografii magnetycznego rezonansu jądrowego).
Adam Piątkowski, Prof., D.Sc.,
P. Bogorodzki, E. Piątkowska-Janko, J. Wa-sielewski, A. Wasilewski
14.05.97 - 31.05.98

Modern MR scanners put strong demands on magnetic field homogeneity. The hybrid method allowing static magnetic field correction has been developed and implemented. By optimization of magnet coils placement and proper use of passive as well as active shimming correction techniques the method makes it possible to obtain homogeneity desired for magnetic resonance imaging purposes.

[Pro16] **Spectroscopic Method for in vivo Measurements of Bone Density and Toxic Metals Concentrations in Bones.** (Spektroskopowa metoda badań in vivo gęstości tkanek kostnych i stężeń ciężkich metali toksycznych w kościach).
Zdzisław Pawłowski, Prof., D.Sc.,
J. Marzec, B. Konarzewski
14.05.97 - 31.05.98

A two-component model of bone tissue was developed for measurements of bone density with spectroscopic method. This model was verified by phantoms' measurements and used in patients' bone density measurements. Optimal measuring conditions (the radiation energy and angles of emitted and detected beams) were determined for spectroscopic method for measurements of bone density and toxic metals concentrations in bones. Bone density was measured by CCSR method, toxic metals concentrations by XRF method. Series of measurements of phantoms and human bones were carried out. The error of density measurements was about 0,01 g/cm^3, the detectability level of toxic metals concentrations was about 30 ppm.

[Pro17] **Novel adaptive wavelet-based algorithm for image data** (Nowy algorytm kompresji obrazów z wykorzystaniem adaptacyjnych modeli transformaty wavelet).
Artur Przelaskowski, Ph.D
14.05.97 - 31.05.98

A novel compression method called MBWT (modified basic wavelet technique) for efficient medical image compression was elaborated. MBWT is based on classic wavelet compression scheme with dyadic decomposition, uniform scalar quantization and entropy coding of wavelet coefficients. By exploiting space-frequency data characteristics in wavelet domain, an algorithm of adaptive quantization and separable context-based binary coding with two (bitewise and wordwise) arithmetic coders are proposed. Also the most suitable filter banks selection is included. Quantization step size estimating is performed for each subband on the base of two items: established image quality level and wavelet coefficients' variance estimation. Additionally adaptive threshold data selection is performed for reduction of unimportant coefficient in noisy areas. 9-order noncausal context model depicts the importance of each data from spatial correlation. Also significance of parent node is taken into account as frequency-domain correlation. Entropy coding concept includes three main elements: a) a construction of a decomposition tree with significant and insignificant nodes, b) pruning the tree - modified zerotree construction with four symbols of alphabet, c) separable arithmetic coding of two statistically distinct data streams - set of significant coefficients and a significant root node map with the signs of significant data. The MBWT algorithm seems to be simpler than the majority of the efficient wavelet compression techniques although is not

fully progressive (without successive approximation). The compression efficiency of our method is competitive with the best algorithms in the literature across diverse classes of medical images. Significant efficiency improvement over SPIHT algorithm is clearly visible for all tested images.

Projects granted by the Dean

[Pro18] **The new method of analysis of T-wave alternans.** (Nowa metoda badania naprzemienności załamka T sygnału EKG).
Tomasz Buczkowski, Ph.D.,
D. Janusek
5.09.97 - 31.05.98

Mobile test stand for T-wave analysis has been established. Specialized software has been developed, tested and modified. The new method eliminating the need for external pacing during T-wave analysis has been verified in time- and frequency domain.

[Pro19] **Method for measurement of power and frequency behaviour of radiocommunication transmitters during transient states** (Metoda pomiaru zmian mocy i częstotliwości nadajników radiokomunikacyjnych w czasie włączania i wyłączania).
Adam Fiok, Prof.,D.Sc.,
J. Kołakowski
5.09.97 - 31.05.98

The project deals with measurements of signals emitted by a radiocommunication transmitter during transient states. The method for evaluation of transients based on Short Time Fourier Transform as well as test arrangement have been proposed and their features have been investigated. The project resulted in software: for automated transient evaluation.

[Pro20] **Synthesis and Optymizing of the Radiation Pattern of a Finite Grating Integrated with a Planar Dielectric Waveguide** (Synteza i optymalizacja mikrofalowej anteny paskowej z falą bieżącą).
Jacek Jarkowski, Ph.D.,
J. Modelski, E. Yaszczyszyn
5.09.97 - 31.05.98

The results of analyze and optimization of the radiation pattern of finite grating integrated with a planar dielectric waveguide are examined. The mathematical model for synthesis and optimizing of such structure is based on impedance boundary conditions. The modificated Powell's method is used for optimization process. The high accordance of theoretical calculations with practical results were obtained as far as radiation pattern is concern.

[Pro21] **Hybrid method of image sequence compression** (Hybrydowa metoda kompresji sekwencji obrazów cyfrowych).
Andrzej Buchowicz, Ph.D.,
W. Skarbek, J. Modelski, J. Marzyjanek,
J. Gabryś, K. Mroczek
5.09.97 - 31.05.98

The development of the hybrid method of the image sequence compression was the subject of the project. The new method was planned as a modification of the compression method specified in the MPEG-2 standard where instead of Discrete Cosine Transform the Wavelet Transform would be used. However the analysis of the available literature has shown that such modification can not give the expected improvement of the image quality or compression ratio. Several experiments with the use of well known SPIHT wavelet compression have been conducted under the project. They have explicitly shown that errors are propagated to the large distances when wavelet transform is used. This propagation is caused by the fact, that all image is processed in the same time with the wavelet transform. The effect does not occur when image is divided into small block which are separately processed e.g. with the use of DCT. The error propagation can not be eliminated by any more sophisticated method of the wavelet transform coefficients quantization. The implementation of the wavelet transform in image sequence compression would result in the propagation of the errors caused by imperfect motion estimation, and the distance these error would propagate would be larger if there are more P and B frames between I frames in the Group of Pictures.

[Pro22] **Subjective Measurement Methods of Television Picture Quality in Compression Systems** (Subiektywne metody oceny jakości obrazu telewizyjnego w systemach z kompresją).
Józef Modelski, Prof., D.Sc.,
T. Krzymień
5.09.97 - 31.05.98

The project aims to develop measurement unit to subjective assesstment of TV picture quality in MPEG-2 and other compression standards. In accordance with ITU-R BT.500-6 and ITU-R BT.1082-1 recommendations suitable single-stimulus ratio-scaling method has been chosen to carry out test sessions. M-JPEG Video Capture FAST card installed in Pentium Computer was tested using EBU sequences. The results show the performance of PC as a TV recorder. The main result of this project is a universal measurement unit for subjective picture quality testing in any compression system. Introduction and support into objective methods was also obtained.

[Pro23] **Electronic Transducers for Acoustic Emission.** (Czujniki elektroniczne emisji akustycznej).
Jerzy Narkiewicz-Jodko, Ph.D.,
A. Leszczyński, M. Baszun, L. Książek,
K. Kędra
5.09.97 - 31.05.98

High quality electroacoustic transducers are necessary for acoustic emission phenomenon measurements using multichannel analyzers.. These transducers are available from specialized companies but they are quite expensive. So we decided to design and build our own ultrasonic transducers. The construction, production technology and investigation results of several samples of wide-band piezoceramics transducers are presented.. A laboratory stand for the transmission performance of the ultrasonic transducers is described (mainly for time and frequency domain tests using FFT up to 1MHz). Based on the tests results, a final conclusion is given that the parameters of the home made transducers are comparable to those of the factory made transducers. Obtained results will be

useful for teaching purposes and the investigations of ultrasonic transducers are to be continued.

[Pro24] **Application of variational methods of parameter estimation and neural networks for static calibration of a microwave dielectrometer** (Zastosowanie wariacyjnych metod estymacji parametrów oraz sieci neuronowych do statycznego wzorcowania dielektrometru mikrofalowego).
Andrzej Miękina, M.Sc.,
J. Piotrowski

The measurement principle of a microwave dielectrometer is based on measuring the resonance curve of a microwave resonator filled with a substance to be analysed. Taking into account the existing relationship between the complex dielectrical permeability of the substance ε and the shape of the resonance curve, a procedure for calibration of the dielectrometer was proposed based on the assumption that the estimation of the measurand ε comprises the estimation of the parameters of the resonance curve, and subsequent estimation of ε on the basis of those parameters. The main objective of the project was to study applicability of:

- variational methods of approximation of the resonance curve - for estimation of its parameters;
- neural networks - for approximation of the dependence of ε on those parameters.

The research work accomplished on this project resulted in two new algorithms of dielectrometer calibration. The systematic study of those algorithms, based on both synthetic and real-world data confirmed their practical applicability.

[Pro25] **Application of Digital Signal Processors in the Selected Instrumentation for Noise and Vibration Measurement and Analysis.** (Zastosowanie procesorów sygnałowych w wybranej aparaturze do pomiaru i analizy hałasu i drgań).
Andrzej Podgórski, Ph.D.,
R. Z. Morawski, A. Miękina
5.09.97 - 31.05.98

The purpose of the work was to develop the communication procedures between the user and the model of an adaptive signal generator, the simplified version of audio-analyser dedicated to study the algorithms required for generating danger signals in the presence of the environmental noise. The generator operates in adaptive mode. It means that parameters of the danger signals are being updated in real-time to achieve the best signal audibility. For this reason the instrument constantly analyses the noise octave spectrum in the band from 125 Hz to 4000 Hz. The different danger signals are generated with the possibility of taking into account the attenuation characteristics of the hearing protectors. The operator can select functions and their parameters using menu. The worked out algorithms are implemented in the TMS320C50 digital signal processor which is used to control the interface between the user and the instrument's model. The software was verified and tested in the different environment conditions by the team from the Central Institute for Labour Protection.

[Pro26] **IEC-625 Measuring System Controlling via Computer Network** (Projektowanie rozproszonych systemów pomiarowych z wykorzystaniem sieci komputerowych).
Wiesław Winiecki, Ph.D.,
K. Adamowicz, R. Leoniak, R. Łukaszewski, G. Ciasnocha
5.09.97 - 31.05.98

Aspects of applying computer networks in remote controlled measuring systems were considered. A measuring system IEC-625 connected with computer network was designed. Some measuring experiments using the system and Ethernet network were performed and described. Concept and design of Ethernet/IEC-625 converter was presented.

[Pro27] **Investigation of possibilities to couple three-dimensional electromagnetic simulation with zero- and one-dimensional nonlinear simulation.** (Analiza możliwości sprzężenia trówymiarowych symulacji elektromagnetycznych z zero i jednowymiarowymi symulacjami.)
Małgorzata Celuch-Marcysiak, Ph.D.,
W. Gwarek, M. Sypniewski, A. Więckowski
5.09.97 - 31.05.98

Objectives:

a) to examine distributed models of nonlinear elements as described in open literature,
b) to extend 0-D models of lumped elements (consistent with FDTD) to a 1-D form,
c) to consider a scheme for interfacing FDTD and circuit simulators.

Main results:

1. New stable and efficient 1-D and 2-D models of lumped impedance terminations of microwave guiding structures; the models are based on impedance distribution over the line's cross-section weighted with the modal field template.
2. Stable coupling of circuit and electromagnetic solvers - continuation and extension of earlier studies to 2-D models of lumped components.
3. Problems with point sources and the concept of distributed sources - convergence problems are detected in the case of FDTD antenna simulations using auxiliary point sources. The reason of these problems is shown to reside in local spurious static solutions being an additional eigenmode of the algorithm. The problems are eliminated by developing a 1-D excitation model through a section of TEM line.

The results have been presented in a review paper at MIKON conference (Krakow'98), in a paper accepted for IEEE AP-S (Atlanta'98), and in a summary submitted to APMC conference (Yokohama'98). They will also be discussed at a seminar in National Radio Astronomy Observatory, USA.

[Pro28] **Design of Microwave Phase Shifters and Switches** (Projektowanie mikrofalowych przełączników i przesuwników fazy).
Tadeusz Morawski, Prof., D.Sc.,
J. Zborowska, W. Wojtasiak, D. Gryglewski, R. Michnowski, M. Kukier
5.09.97 - 31.05.98

In microwave telecommunication systems, radiolocation and measurement systems microwave analog and digital

phase shifters are widely used. In analog shifter case, varactor diodes are used. In the case of digital shifters PIN diodes, MESFET transistors or integrated switches are applied. Two new types of phase shifters were proposed and analysed: analogue phase shifter with two varactors (due to use of two reflecting circuits with shifted frequency bands broad 1.6 - 2.4 GHz band have beenobtained) and four-state phase shifter (due to use of reflecting circuits having different phase shifts four states were obtained by using minimal number of PIN diodes). Dispersive nonuniform have been used in four-state transmission type shifter with GaAs MESFET integrated switches manufactured by MACOM, type SW419. Good electrical parameters of octave-band 0.8 - 1.6 GHz shivter have been obtained.

[Pro29] **Blood flow in brain on the basis of single photon computer tomography patients' studies** (Analiza przepływu krwi w mózgu w badaniach tomograficznych SPECT)
Piotr Brzeski, Ph.D.,
R. Szabatin, W. Smolik, D. Ćwiek, T. Olszewski
5.09.97 - 31.05.98

The goal of this work is to develop a clinical application supporting analysis of cerebral blood flow in SPECT. In theoretical part regulation of the cerebral blood flow mechanism was analized and basic methods used in assessment of cerebral blood flow were presented. Then a review of CBF analysis method was made in order to determine most suitable method for computer implementation. Two clinical applications for regional cerebral blood flow analysis were developed. These applications supported physicians in diagnosis of cerebral blood flow disturbances.

[Pro30] **Methods For Determining Diagnostic Accuracy Of Lossy Compressed Medical Images** (Metody określania diagnostycznej wiarygodności obrazów medycznych).
Marian Kazubek, Ph.D.,
A. Przelaskowski, T. Jamrógiewicz
5.09.97 - 31.05.98

No single approach to quality and diagnostic accuracy measurement has gained universal acceptance, but two general approaches became dominant: computable objective distortion measures such as mean squared error (MSE) or signal-to-noise ratio (SNR) and statistical analysis (e.g. ROC). We evaluated a new vector measure, which allow to characterise a kind and a quantity of distortion and to evaluate diagnostic accuracy and acceptable compression level. We used a wavelet transform to decompose the images and computed energy feature (variances) from the 3-level decomposition to form 9-dimensional vector. Based on this feature vector we propose to use chi-square value as a measure of similarity of original and compressed image data. We seek also for 2-dimensional measure of image distortion, which will be more convenient than classical Hossaka plots. For this purpose we use SVD decomposition of the feature vector. The image quality factor is presented as a point at the surface defined by two dominant eigenvalues. The preliminary results shows, that this method may be more adequate to estimation of degradation of diagnostic quality of compressed medical images.

[Pro31] **Medical Image Data Transmission for Telediagnosis** (Transmisja obrazów medycznych dla potrzeb telediagnostyki).
Jacek Mirkowski, Ph.D.,
M. Kazubek, L. Padee, T. Jamrógiewicz
5.09.97 - 31.05.98

The goal of this work was to elaborate medical image data transmission system architecture, studies and learning programming tools to allow build applications independent from hardware platform (JAVA). The system building possibility was carry out. The system architecture project was elaborated taking carry a hardware possibilities and programming tools accessibility. As a programming tools the Microsoft Visual J++ packet was chosen. An application example was realised as applet which can be activated from Server using standard internet tools as Netscape Navigator or Internet Explorer from user computer station. This work will be continued cause for planing purchase of USG apparatus. For continuation we propose most friendly for users environment JBuilder packet (Borland).

[Pro32] **The Method for the Brain Stroke Imaging Based on Dynamic Scanning Protocols** (Obrazowanie udaru mózgowego za pomocą tomograficznych badań dynamicznych).
Adam Piątkowski, Prof., D.Sc.,
P. Bogorodzki
5.09.97 - 31.05.98

A novel method for functional image evaluation from image set obtained in sequential CT or MRI scanning, after contrast agent injection, has been developed. Method converts temporal set of images of first-pass transit of injected contrast, to single parametric image. The main difference between proposed procedure and other widely accepted methods is fact, that our method applies to the each concentration-time curves correlation and discrimination analysis, instead of fitting them to the given 'a priori' tracer kinetics model.

Priority grants

[Pro33] **Applied combinatorics and discrete optimization** (Zastosowania kombinatoryki i optymalizacja dyskretna w zagadnieniach sieciowych).
Jacek Wojciechowski, Prof., D.Sc.,
17.06.97-31.05.98

The project was aimed in the optimal design, operation and scheduling of networks. The techniques used are: combinatorics, graph theory, discrete optimization (e.g.evolutionary and k-optimal algorithms, simulating annealing). The specific tasks were: design of graph with optimally reliable structures, design of robust telecommunication networks, optimal scheduling, design of microwave circuits with the use of evolutionary algorithms. The project was a part of the interfaculty priority program „Control, automation, and information technology", sponsored by the rector of the University. The number of participants is 10, including 4 Ph.D. students.

[Pro34] **3D vascular imaging from linear 1D transducer and Power Doppler system**

(Trójwymiarowa rekonstrukcja naczyń krwionośnych w oparciu o dane ze skanera z głowicą liniową 1D i systemem Power Doppler).
Marian Kazubek, Ph.D.,
J. Mirkowski, T. Jamrógiewicz, L. Padee, A. Przelaskowski,
1.05.97 - 31.05.98

We analysed the following registration systems of 3D spatial information: free-hand, mechanical arm, optical transducer shadow, electromagnetic or ultrasonic commercial positioning. Also reconstruction and presentation in 3d space is realised: edge detection, Bezier interpolation and contour based surface rendering, shadowing, user-friendly manipulation.

[Pro35] **A Multichannel, Digital MRI Radiofrequency Receiver** (Techniki cyfrowe odbioru sygnału radiowego w tomografii MR).
Adam Piątkowski, Prof., D.Sc.,
P. Bogorodzki, E. Piątkowska-Janko, J. Wasilewski
1.04.97 - 1.08.98

The main goal of the project was to develop a VME standard board with two independent radiofrequency inputs. Fast 12 bits A/D converter will digitize each channel at max. rate 40 MHz. After digitalization signal will be down converted by DDC (Harris HSP-50016 **D**igital **D**own **C**onverter) with fully programmed intermediate frequency as well as phase. Detected signal from the DDC will be send to TMS320C50 signal processor by serial port. Specialized software will be implemented to perform required phase correction as well as fine phase tuning. Up to four VME board can be used allowing eight fully programmed radiofrequency channels. This fully digital radiofrequency receiver will be used in experimental phased array coils arrangement in low field (6 MHz) Magnetic Resonance Tomograph. Another possible applications of mentioned hardware include ultrasound and communication equipment.

[Pro36] **Research And Didactic Workstation For Spect Tomography** (Stanowisko badawczo-dydaktyczne dla tomografii jednotonowej SPECT).
Roman Szabatin, Ph.D.,
P. Błociszewski, P. Brzeski, D. Ćwiek, M. Karolczak, T. Olszewski, W. Smolik,
1.04.97 - 1.08.98

The aim of this work was to design modern Workstation for emission tomography study. For this purpose we made:

1. The aquisition interface and software for processing of analog signals from OMEGA 500 SPECT gammacamera.
2. Software for calculation of the image quality parameters

The developed interface and software provide data aquisition up to 300 000 counts/sec. and obtained quality parameter of images - uniformity of field of view is lower then 3%.

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

[Pro37] **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.

[Pro38] **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.

[Pro39] **Novel High-Efficiency Circuits Utilizing HF Technique for Synthesizing Low-Frequency Power Signals** (Nowe rozwiązania wysoko-sprawnych układów syntezy przebiegów wolnozmiennych mocy z wykorzystaniem układów wielkiej częstotliwości).
Mirosław Mikołajewski, Ph. D.,
J. Ebert, J. Modzelewski, A. Owczarek, K. Puczko, K. Radecki
2.06.1997 - 31.05.1998;

- Research on optimisation of novel circuits for synthesizing low-frequency power signals in which high-efficiency switching resonant power amplifiers are applied.
- Novel circuits for synthesizing low-frequency power signals. In the circuits high-efficiency power amplifiers Class D or Class E are applied as a h.f. energy source.
- Optimisation of Class D and Class E amplifiers to meet specific requirements of the circuits (wide-range output power regulation at a constant operation frequency). In the circuits synchronous h.f. regulators comprising MOSFET transistors are utilised.

Practical verification of the laboratory models of the circuits.

[Pro40] **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 - 31.05.99)

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-Damplifier (called the Class-Du Zero-Voltage-Switching (ZVS) amplifier)in which the soft-switching technigue is used. The optimum and suboptimum operations of the Class-Du ZVS amplifier are analysed and the axperimental power amplifiers are built and tested.

[Pro41] **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. Szafrański, Nguyen Lien Huong, A. Witan;
8.07.96 - 30.06.99

The objectives of the project use as follows:

- Development of new algorithms for calibration of measurement channels and for measurand reconstruction, based on:
  - constrained optimisation making possible full utilisation 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.

[Pro42] **Enhancement of the efficiency of time-domain electromagnetic analysis of 3- D microwave circuits by application of multi-thread programming techniques.**(Poprawa efektywności analizy elmagnetycznej 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 makes multiprocessor machines more and more popular. The main aim of the project is to adapt the programming techniques used in em modelling to make most effective use of such machines.

[Pro43] **Design of Linear Microwave Power Amplifiers** (Projektowanie liniowych mikrofalowych wzmacniaczy dużych mocy).
Tadeusz Morawski, Prof., D.Sc.,
W. Wojtasiak, J. Zborowska, D. Gryglewski, K. Robaczyński, M. Lubiejewski
31.01.97 - 30.09.98

- Elaboration of methods of linear power amplifier design.
- Experimental examination of designed linear power amplifier.

[Pro44] **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.

[Pro45] **Methods and Instrumentation for the Simultaneous Registration and Processing of Ventricular and Atrial Late Potentials** (Metody i urządzenia do jednoczasowej rejestracji przetwarzania i analizy potencjałów przedsionkowych i komorowych z jednoczesnym wspomaganiem diagnozy).
Piątkowski Adam, 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 optimum number of parameters for late potentials vector which gives higher persentage of right decision and good separation of patients from different group.
- Suggestion of mathematical analysis for diagnosis support.

[Pro46] **The Matched MRI and SPECT Method for Investigation of the Neuro System**. (Skojarzona metoda badania ośrodkowego układu nerwowego z zastosowaniem techniki magnetycznego rezonansu (MR) i tomografii izotopowej jednofotonowej (SPEC).
Roman Szabatin, Ph.D.,
T. Pałko, L. Królicki; P. Brzeski, D. Ćwiek, P. Błociszewski, W. Smolik, K. Mikołajczyk, P. Rudnicki, Z. Grabowski, K. Szapiński, A. Luft, J. Rogala
01.08.96 - 31.07.98

- Analysis of image registration and fusion of the same patient investigated by MRI and SECT as a very effective method for the diagnosis of brain diseases such as: epilepsy, brain infarct, tumor metastasis.

- Development of a computer system for the evaluation of multimodality images.
- New diagnostic matched method for image fusion of the morphologic and functional images.
- Multimodality image registration algorithms and software for data analysis and implementation to brain study.

4.3. Other projects

[Pro47] **Experimental broadcasting of electric power managment commands from the long-wave transmitter located in Radom.** (Przeprowadzenie próbnej emisji telegramów radiowego sterowania mocą w energetyce - z nadajnika w Radomiu).
Tomasz Buczkowski, Ph.D.,
1.07.98 - 15.08.98
Fund by Margot Engineering.

Long-wave transmitter in Radom has been equipped with a new FSK modulator. Software supporting communication with users and controlling transmission of commands has been developed. Experimental system has been set up and reception of ON-OFF commands at several locations in Poland has been tested.

[Pro48] **Development of Remotely Controlled Radiomonitoring Site** (Koncepcja 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.

[Pro49] **The Possibilities of Using the Frequency Range from 150KHz to 30MHz for the Digital Broadcating Applications** (Analiza możliwości wykorzystania zakresu częstotliwości 150KHz÷30MHz dla potrzeb radiofonii cyfrowej).
Jacek Jarkowski, Ph.D.,
S. Hahn
23.05.96 - 31.03.98
Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR)

All aspects of digital broadcasting in frequency range of 150 kHz - 30 MHz 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 analyzed.

[Pro50] **A Measuring System for Carrier Frequency Offset Measurement of Radio and TV Transmitters** (Koncepcja 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 the screen or on the printer. The program enables one to present these data on-line or off-line using specialised data base program.

[Pro51] **Modelling of field distribution as well as transmission and reflection coefficients in TEM cells** (Wyznaczenie rozkładów pól elektromagnetycznych i charakterystyk transmisji i odbicia dla wzorcowych symetrycznych otwartych linii paskowych).
Wojciech Gwarek, Prof.,D.Sc.
25.08.98 - 31.10.98
Fund by CIOP.

TEM cells are used for various electromagnetic compatibility applications. The goal of the project was to model the cell parameters and verify the results of modelling against available measurements. This opens the possibility of future improvements in the construction of the cell and measurements techniques on the base of the computer models.

[Pro52] **Modernizing and Testing of 2 AP1 Sets with Electronic Modulators before Final Tests** (Opracowanie metodyki modernizacji i badań oraz modernizacja i przygotowanie do badań końcowych 2 szt. zespołów AP1 z modulatorami elektronicznymi)
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).
Krzysztof Kowalski, Ph.D.,
12.03.98 - 30.05.98
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro53] **Design and Hardware Realisation of Microwave Amplifier for C Band** (Opracowanie i wykonanie wzmacniacza mikrofalowego na pasmo C).
Wojciech Wojtasiak, Ph.D.,
T. Morawski, G. Gryglewski, R. Michnowski, M. Lubiejewski
31.03.98 - 31.08.98
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia)

- Development of high-power amplifier with GaAs MESFET for amplification of noise signal at C-band

- Elaboration of design procedure and construction process of high-power amplifier with minimum flat gain
- Design, modelling and measurement of active and passive circuits.

[Pro54] **Autonomic Testing and Verification of 14 AP1 Sets before Fire Tests** (Opracowanie metodyki badań oraz przeprowadzenie autonomicznych badań i weryfikacji 14 zespołów AP1 przed próbami poligonowymi).
Krzysztof Kowalski, Ph.D.,
8.05.98 - 30.06.98
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro55] **Autonomic Testing and Verification of 8 AP1 Sets before Fire Tests** (Opracowanie metodyki badań oraz przeprowadzenie autonomicznych badań i weryfikacji 8 zespołów AP1 przed próbami poligonowymi).
Krzysztof Kowalski, Ph.D.,
18.06.98 - 15.08.98
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro56] **Testing, Improvement and Complex Regulation of 9 AP1 Sets** (Opracowanie metodyki badań i usprawnień oraz badanie i usprawnienie poprzez kompleksową regulację 9 szt. zespołów AP1.
Krzysztof Kowalski, Ph.D.,
18.06.98 - 15.08.98
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro57] **The Possibilities of Using the New Ingrated Accelerometers in Autopilots** (Analiza możliwości wykorzystania nowoczesnych układów scalonych czujników przyśpieszeń liniowych i systemach automatycznego kierowania obiektów latających).
Krzysztof Kowalski, Ph.D.,
5.09.98 - 4.12.98
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro58] **Design and Hardware Realisation of Frequency Counters TED-3CMOS for 3÷10GHz and 10÷13GHz Band.** (Opracowanie i wykonanie częstościomierzy TED3CMOS na zakres częstotliwości 3÷10GHz, 10÷13GHz).
Wojciech Wojtasiak, Ph.D.,
T. Morawski, G. Gryglewski, R. Michnowski, M. Lubiejewski
12.02.98 - 31.05.98
Project developed in cooperation with the Military University of Technology (Wojskowa Akademia Techniczna)

A new version of the frequency counter TED-3CMOS for 3÷10GHz and 10÷13GHz band design, using high frequency dynamic prescalers.

[Pro59] **Design and Hardware Realisation of Jig Model for Missile Speed Measurement.** (Opracowanie i wykonanie modelu głowicy do pomiaru prędkości pocisków).
Wojciech Wojtasiak. Ph.D.,
T.Morawski, G.Gryglewski, R.Michnowski, M.Lubiejewski
15.09.98 - 15.11.98
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia)

- Developing a method for construction of microwave devices for speed measurement based on the Doppler effect
- Experimental investigations of designed Jig model

[Pro60] **Program for file conversion from ICON to NMS standard** (Program do konwersji plików ICON do formatu NMS szt1).
Piotr Brzeski, Ph.D.,
20.03.98 - 3.04.98
Fund by Medical Academy in Lodz.

Computer systems in nuclear medicine are equipped with producer dependent file format. Because of that, it is impossible to process patients data on other than the producer work stations. The software elaborated enables simple data transfer from Siemens standard (ICON) as well as its processing on work stations using NMS standard.

[Pro61] **COMPASS Experiment - Design of Apparatus and Software Development**, part I (Eksperyment COMPASS - budowa aparatury i przygotowanie oprogramowania, I etap).
Krzysztof Zaremba, M.Sc.,
Z. Pawłowski, J. Marzec, B. Konarzewski, G. Domański
01.01.97 - 30.08.98
Fund by Soltan Institute for Nuclear Studies (Instytut Problemów Jądrowych, Świerk).

- Design of the read-out system for the 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.

[Pro62] **COMPASS Experiment - Design of Apparatus and Software Development, part II** (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 Soltan Institute for Nuclear Studies (Instytut Problemów Jądrowych, Świerk).

- Design of the read-out system for the 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.

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5. DEGREES AWARDED

5.1. Ph.D. Degrees

[PhD1] Piotr Bogorodzki: *„Obrazowanie obszaru udaru mózgu z wykorzystaniem tomograficznych badań dynamicznych"* (Brain Stroke Imaging Method Based on Dynamic Scanning Protocol), Prof. **A. Piątkowski** (tutor), Warsaw 1998.

[PhD2] Wojciech Kazubski: *„Badanie właściwości termicznych diod Gunna"* (Investigation of the Thermal Properties of the Gunn Diods) Prof. **J. Modelski** (tutor), Warsaw 1998.

[PhD3] Bogumił Konarzewski: *„Spektroskopowa metoda badań in vivo gęstości tkanek kostnych i stężeń ciężkich metali toksycznych w kościach"* (Spectroscopic method for in vivo bone density and toxic metal concentrations in bones measurements) Prof. **Z. Pawłowski** (tutor), Warsaw 1998.

[PhD4] Andrzej Miękina: *„Zastosowanie wariacyjnych metod odtwarzania mezurandów do poprawiania dokładności analiz spektrometrycznych",* (Application of variational methods of measurand reconstruction for improving resolution of spectrometric analyses) Prof. **Roman Z. Morawski** (tutor), Warsaw 1998.

[PhD5] Witold Mizera: *„Metody projektowania quasi-synfazowych, mikrofalowych szyków antenowych o podwyższonej obciążalności energetycznej"* (Methods for designing the in-phase microwave antenna arrays with improved an electrical durability) Prof. **Stanisław Rosłoniec** (tutor), Warsaw 1998.

[PhD6] Wojciech Wojtasiak: *„Wykorzystanie własności fazowych niejednorodnych prowadnic falowych w projektowaniu układów mikrofalowych*" (Application of the phase properties of nonunuform transmission lines for the microwave circuits design). Prof. **T. Morawski** (tutor), Warsaw 1998.

5.2. M.Sc. Degrees

[MSc1] Mariusz Barnaś: *„Dwukanałowy, cyfrowy odbiornik sygnału FID tomografu rezonansu magnetycznego"* (Multichannel radiofrequency receiver for MRI phased array coils), Prof. **A. Piątkowski** / Assist. **P. Bogorodzki** (tutors), (5).

[MSc2] Piotr Bobiński: *Metodyka projektowania systemów pomiarowych w graficznych zintegrowanych środowiskach programowych"* (Methodology for Measuring Systems Designing Using Integrated Software Environments), Assist. Prof. **W. Winiecki** (tutor), (5).

[MSc3] Grzegorz Borowski: *„Quasi aktywny ogranicznik mocy mikrofalowej"* (Quasi-active microwave power limitter), Assist. Prof. **J. Zborowska** (tutor), (5).

[MSc4] Piotr Bubak: *„Zniekształcenia nieliniowe w sieciach telewizji kablowej"* (Nonlinear distortion in CATV systems), Assist. Prof. **K. Derzakowski** (tutor), (5).

[MSc5] Przemysław Burzyński: *„Symulator kanału radiowego na procesorze sygnałowym"* (A mobile radio channel simulator using the DSP), Assist. Prof. **K. Czerwiński** (tutor), (5).

[MSc6] Tomasz Cegielski: *„Algorytm genetyczny do projektowania kształtów obwodów mikrofalowych"* (A genetic algorithm for the design of microwave circuit's shape), Assist. Prof. **P. Miazga** (tutor), (5).

[MSc7] Gerard Ciasnocha: *„Sterowanie urządzeniami IEC-625 z wykorzystaniem sieci komputerowych"* (Application of Computer Network for IEC-625 Devices Controlling), Assist. Prof. **W. Winiecki** (tutor), (5).

[MSc8] Tomasz Dąbrowski: *„Karta interfejsu ISA PC dla systemu cyfrowej radiologii"* (ISA IC interface for digital radiology), Assist. Prof. **R. Szabatin** (tutor), (4,5).

[MSc9] Blend Faja: *„Opracowanie koncepcji akustyki i elektroakustyki studia nagrań średniej wielkości"* (Acoustics and electroacoustics the medium size radio studio), Assist. Prof. **M. Tajchert** (tutor), (4).

[MSc10] Grzegorz Głos: *„Laboratoryjny model czujnika do pomiaru zmian ukrwienia skóry"* (Skin blood supply probe - laboratory model), Assist. Prof. **M. Bebłowska** (tutor), (5).

[MSc11] Dariusz Grabowski: *„Koncepcja i model rozproszonego systemu namierzania radiowego"* (Model of Distributed System for Direction Finding), Assist. **J. Cichocki,** / Assist. **J. Kołakowski** (tutors), (5).

[MSc12] Jacek Guz: *„Zastosowanie metody L-krzywej do odtwarzania mezurandów w spektrometrii i kalorymetrii"* (Applications of the L-curve method for measurand reconstruction in spectrometry and calorimetry), Prof. **R. Z. Morawski** (tutor), (3,5).

[MSc13] Leszek Hołubowicz: *„Projekt układu sterowania karty Framme Graber do komputera PC"* (The project of a control system of Frame Graber card for PC computer), Prof. **J. Modelski,** / Assist. **J. Kondarewicz** (tutors), (4).

[MSc14] Witold Homa: *„Układ do odbioru i przetwarzania sygnałów pozycyjnych gammakamery"* (Mode for receiving and

processing gammakamera position signals), Assist. Prof. **R. Szabatin** (tutor), (5).

[MSc15] Krzysztof Jóźwik: *„Urządzenie nadawcze i odbiorcze do systemu informacji dla osób niewidomych"* (Transmitter and Receiver for Information System for Blinds), Assist. Prof. **K. Radecki** (tutor), (5).

[MSc16] Zbigniew Jurak: *„Model nadajnika impulsu zapytującego na pasmo L"* (L-band Asking Pulse Transmitter), Assist. Prof. **W. Wojtasiak** (tutor), (5).

[MSc17] Artur Krakowiak: *„Odbiornik z programowym przetwornikiem sygnałów"* (Laboratory model of software radio), Prof. **A. Fiok** / Assist. **J. Kołakowski** (tutors), (4,5).

[MSc18] Marek Krawczyk: *„Czterostanowy dwudiodowy modulator fazy"* (Four-state Two-diodes Phase Modulator), Assist. Prof. **J. Zborowska** (tutor), (5).

[MSc19] Piotr Krawczyk: *„Szerokopasmowy analogowy przesuwnik fazy z diodami waraktorowymi"* (Broad-band analog phase shifters with waractor diodes), Prof. **T. Morawski** (tutor), (4,5).

[MSc20] Adam Kujawa: *„Źródło sygnału wysokoiej częstotliwości do badania radioodbiorników z modulacją częstotliwości"* (RF signal source for FM radio testing) Assist. Prof. **J. Cichocki** (tutor), (3,5).

[MSc21] Robert Kwapisz: *Właściwości modulacji cyfrowych. Metody zwężania pasma i ich wizualizacja"* (Properties of digital modulations. Band compression methods and their visualisation), Assist. Prof. **J. Jarkowski** (tutor), (4,5).

[MSc22] Tomasz Lato: *„Kwantyzacja wektorowa w zastosowaniu do redukcji liczby kolorów w obrazach cyfrowych"* (The reduction of the number of colours in digital images with the use of vector quantization), Assist. Prof. **A. Buchowicz** (tutor), (5).

[MSc23] Andrzej Lech: *„Badania modeli propagacji fal radiowych w kanale radiokomunikacji ruchomej"* (Models of radio wave propagation in mobile communication channel), Assist. Prof. **K. Czerwiński** (tutor), (5).

[MSc24] Tomasz Lenart: *„Identyfikacja obszarów koncentracji ruchu w cyfrowej sieci komórkowej systemu GSM"* (Traffic localization in cellular GSM system), Assist. Prof. **T. Buczkowski** (tutor), (5).

[MSc25] Wojciech Małek: *„Sala nagrań studia dźwiekowego"* (Acoustical Adaptation of the Sound Recording Studio), Assist. Prof. **A. Leszczyński** (tutor), (5).

[MSc26] Piotr Markiewicz: *„Impulsowany wzmacniacz mocy na pasmo C"* (Pulsed power amplifier for C-band), Assist. Prof. **W. Wojtasiak** (tutor), (5).

[MSc27] Stanisław Maszczyk *„Koncepcja i model rozproszonego systemu namierzania radiowego"* (Model of Distributed System for Direction Finding), Assist. **J. Cichocki** / Assist. **J. Kołakowski** (tutors), (5).

[MSc28] Andrzej Mazur: *Spreading Codes and Their Performance measures for DS Spread - Spectrum System*, Prof. **A. Dąbrowski** (tutor), (5).

[MSc29] Tomasz Mazur: *„Pomiarowy generator akustyczny"* (Acoustic Measuring Generator), Assist. Prof. **M. Tajchert** (tutor), (5).

[MSc30] Wojciech Mazur: *„Mikroprocesorowe urządzenie do pomiaru głębokości wewnętrznych warstw ziemnych budowli piętrzących"* (A microprocessor unit for measurement of the depth of inner layers of dams), Assist. Prof. **K. Czerwiński** (tutor), (5).

[MSc31] Nguyen Minh: *Realization of Digital Modulation QPSK and T/4 DQPSK on Digital Signal Processor ADSP_2101*, Assist. Prof. **T. Kosiło** (tutor), (5).

[MSc32] Grzegorz Misiurski: *„Statyczne wzorcowanie przetworników pomiarowych przy użyciu funkcji sklejanych"* (Using Splines for Static Calibration of Transducers), Prof. **R. Z. Morawski** (tutor), (5).

[MSc33] Grzegorz Nalepa: *„Sterownik do quasi-aktywnego agranicznika mocy mikrofalowej"* (Controller for quasi-active microwave power limiter), Assist. Prof. **J. Zborowska** (tutor), (5).

[MSc34] Cezary Niedziński: *„Zastosowanie metody Bayesa do korekcji spektrogramów"* (Application of Bayes method for spectrogram corection), Prof. **R. Z. Morawski** (tutor), (5).

[MSc35] Andrzej Nowak: *„Tester do kontroli systemu KSN na poprawność współpracy"* (A tester for monitoring of telephone modems working), Assist. Prof. **Z. Kozłowski** (tutor), (4,5).

[MSc36] Marek Olszowy: *„Uniwersalny dekoder systemu NICAM"* (The universal decoder of NICAM system), Prof. **J. Modelski,** / Assist. **J. Kondarewicz** (tutors), (5).

[MSc37] Tomasz Pasternak: *„Zastosowanie procesora DSP do poprawy parametrów użytkowych kalibratora drgań mechanicznych"* (Application of DSP to the improvement of the parameters of calibrator with mechanical oscillations), Prof. **J. Modelski** / Assist. **T. Krzymień** (tutors), (5).

[MSc38] Piotr Pawlak: *„Bezprzewodowa transmisja danych w systemach komputerowych z wykorzystaniem podczerwieni"* (Infrared Waves Data Transmission in Computer Systems), Assist. Prof. **W. Winiecki** (tutor), (5).

[MSc39] Robert Pawłowski: *„Symulacja zniekształceń powstających w procesie kompresji obrazu typu I w standardzie MPEG-2 dla obrazów o*

jakości telewizyjnej" (Simulation of the interferences generated in compression process with standard MPEG-2 for the TV pictures), Prof. **J. Modelski** (tutor), (5).

[MSc40] Cezary Pietrzak: *„Metody cyfrowej fotodensytometrii rentgenowskiej w pomiarach masy powierzchniowej składowej mineralnej kości"* (Methods of X-ray digital photodensitometry for bone mineral density measurements), Prof. **Z. Pawłowski** (tutor), (5).

[MSc41] Tomasz Popielewicz: *„Rekonstrukcja obrazów tomograficznych metodą najmniejszych kwadratów"* (Least Square Iteration Method for Image Reconstruction Technique), Assist. Prof. **J. Mirkowski** (tutor), (5).

[MSc42] Jarosław Popkowski: *„Zastosowanie algorytmu genetycznego do projektowania wybranych obwodów mikrofalowych"* (Application of genetic algorithm to the design of a class of microwave circuits) ,Assist. Prof. **P. Miazga** (tutor), (3,5).

[MSc43] Robert Ptak: *„Wykorzystanie systemu GPS do fotogrametrii video"* (Using the GPS for simplified video photogrammetry), Assist. Prof. **K. Czerwiński** (tutor), (4).

[MSc44] Wojciech Rządkowski: *„Graficzna obróbka obrazu telewizyjnego z wykorzystaniem komputera typu AMIGA"* (Graphic processing of TV pictures with making use of the AMIGA-type computer), Assist. Prof. **Z. Kozłowski** (tutor), (4).

[MSc45] Jacek Sierpiński: *„Cyfrowy system do symulacji warunków akustycznych we wnętrzu"* (Digital system for the interior acoustic environment simulation), Assist. **A. Leszczyński,** (tutor), (5).

[MSc46] Jacek Skowroński: *„System telewizji kablowej typu HFC (Habrid Fiber Coax) - szeropasmowa sieć telekomunikacyjna"* (Cable Television System in Hybrid Fiber Coax Technology), Prof. **J. Modelski** (tutor), (5).

[MSc47] Radosław Smoliński: *„Analiza pola akustycznego w studio S-6 Polskiego Radia"* (Acoustic field analysis of the Polish Radio broadcasting studio S6), Assist. Prof. **M. Tajchert** (tutor), (5.

[MSc48] Piotr Sprzęczak: *„Zastosowanie algorytmów genetycznych w procedurach wzorcowania dynamicznego torów pomiarowych"* (Application o genetic algorithms in procedures for dynamic calibration of measurement channels), Assist. Prof. **A. Podgórski** (tutor), (5).

[MSc49] Piotr Stachowicz: *„Projektowanie szerokopasmowych systemów telekomunikacyjnych w technologii HFC"* (Design of the Broadband Telecommunication Systems in HFC Technology), Prof. **J. Modelski** (tutor), (5).

[MSc50] Małgorzata Stawska: *„Biokinetyka ołowiu w organiźmie człowieka"* (Lead biokinetics in human body), Prof. **Z. Pawłowski** (tutor), (5).

[MSc51] Robert Stąporek: *„Stanowisko laboratoryjne do testowania systemu mikroprocesorowego za pomocą ścieżki brzegowej sterująco-obserwacyjnej (standard IEEE 1149.1)"* (Laboratory stand for microprocessor system testing with use of boundary scan (IEEE1149.1), Assist. Prof. **T. Buczkowski** (tutor), (5).

[MSc52] Tomasz Stępniak: *„System monitorowania i oceny jakości cezowego wzorca częstotliwości podczas pracy"* (System for Monitoring and Quality Estimation of Cesium Frequency Standard), Assist. Prof. **K. Radecki** (tutor), (5).

[MSc53] Krzysztof Szpetmański: *„Komputerowy system do udźwiękowiania filmów"* (PC based system for adding sound to films), Assist. **A. Leszczyński, /** Assist. **J. Paluchowski** (tutors), (4,5).

[MSc54] Marek Szwarczewski: *„Laboratoryjny symulator analizatorów widma"* (Simulators of Spectrum Analysers), Assist. Prof. **J. Cichocki** (tutor), (5).

[MSc55] Marcin Szydłowski: *„Projekt interaktywnej sieci kablowej PTK"* (The project of interactive cable network in PTK), Prof. **J. Modelski** (tutor), (4,5).

[MSc56] Robert Szyszka: *„Trójwymiarowa wizualizacja charakterystyk antenowych w zastosowaniu do symulatora elektromagnetycznego FDTD przy użyciu wieloplatformowych bibliotek z App"* (Three dimensional display of antenna radiation patterus calculated by an FD-TD simulator), Assist. Prof. **M. Sypniewski** (tutor), (5).

[MSc57] Mirosław Tarka: *„Laboratoryjny modulator 16-QAM"* (Laboratory Modulator *16-QAM)*, Assist. Prof. **K. Radecki** (tutor), (5).

[MSc58] Robert Tymiński: *„Techniki programowania wielowątkowego - zastosowania w symulatorze elektromagnetycznym FDTD"* (Multithread Programming Techniques - Application in FDTD Electromagnetic Simulator), Assist. Prof. **M. Sypniewski** (tutor), (5).

[MSc59] Grzegorz Wiszowaty: *„Analiza szesnasto-stanowego modulatora amplitudowo-fazowego (16QAM)*, (Analysis of 16-state Amplitude-Phase Modulator), Assist. Prof. **J. Zborowska** (tutor), (4,5).

[MSc60] Maciej Witek: *„Zautomatyzowane pomiary zajętości kanałów z wykorzystaniem analizatora widma" (*Radio-channel occupancy measurements using spectrum analyser), Assist. Prof. **J.Ochocki** (tutor), (4,5)

[MSc61] Artur Witan: *„Estymacja parametrów spektrogramów przy użyciu algorytmu genetycznego"* (Estimation of spectrogram

parameters using a genetic algorithm), Prof. **R. Z. Morawski** (tutor), (5).

[MSc62] Piotr Wojtyniak: *„Karta Frame Grabber do komputera PC”* (The Frame Graber card for PC computer), ,Prof. **J. Modelski, /** Assist. **J. Kondarewicz** (tutors), (5).

[MSc63] Tomasz Wolak: *Analiza technik obrazowania parametrycznego metodą aproksymacyjną”* (Analysis of the parametric imaging technics using approximation methods), Prof. **A. Piątkowski /** Assist. **P. Bogorodzki** (tutors), (5).

5.3. B.Sc. Degrees

[BSc1] Wojciech Romanowicz: *„Filtr z rezonatorem dielektrycznym na pasmo telewizji satelitarnej”* (Dielectric Resonator Filter in Satellite Television Band), Assist. Prof. **K. Derzakowski** (tutor), (4)

[BSc2] Michał Świderek: „*Badanie funkcjonowania stanowiska laboratoryjnego”* (Laboratory Stand Investigation), Assist. Prof. **J. Narkiewicz-Jodko** (tutor), (4)

[BSc3] Bartłomiej Świech: *„Cyfrowy dekoder synchroniczny na procesorze DSP56303”* (*DSP56303 Processor* Based Digital Synchronous Decoder), Assist. Prof. **W. Winiecki** (tutor), (4)

6. PUBLICATIONS

6.1. Scientific and technical books, chapters in books

[Pub1] W. Gwarek: „Analysis of an arbitrarily-shaped planar circuit - A time domain approach". (reprint from IEEE Trans on Microwave Theory Tech. , Vol.33, pp.1067-1072, Oct.1985), In: *Time-Domain Methods for Microwave Structures Analysis and Design* (Ed.: T.Itoh), IEEE Press 1998 (ISBN 0-7803-1109-4).

[Pub2] W. Gwarek: „Analysis of arbitrarily-shaped two dimensional microwave circuits by finite-difference time-domain method". (reprint from IEEE Trans.Microwave Theory Tech. Vol.36, April 1988), In: *Time-Domain Methods for Microwave Structures Analysis and Design* (Ed.: T.Itoh), IEEE Press 1998 (ISBN 0-7803-1109-4).

[Pub3] R. Z. Morawski: "Metody finansowania szkolnictwa wyższego - propozycje brytyjskie" (Methodology of Financing Higher Education - British Approach). In: *„Współpłatność za studia dzienne - część druga"* (Mixed, Public and Private, Financing of Intra-mural Studies - part II), (Ed. J. Woźnicki), pp. 25-37, Program Reformy Szkolnictwa Wyższego i Badań Naukowych, Instytut Spraw Publicznych, Warsaw 1998 (ISBN 83-86917-46-6).

[Pub4] R. Z. Morawski: "Warianty systemu finansowania szkolnictwa wyższego według London Economics" (Variants of Financing Higher Education According to London Economics), In: *„Współpłatność za studia dzienne - część druga"* (Mixed, Public and Private, Financing of Intra-mural Studies - part II), (Ed. J. Woźnicki), pp. 61-67, Program Reformy Szkolnictwa Wyższego i Badań Naukowych, Instytut Spraw Publicznych, Warsaw 1998, (ISBN 83-86917-46-6).

[Pub5] R. Z. Morawski: "Zalecenia dla rządu Wielkiej Brytanii dotyczące systemu finansowania szkolnictwa wyższego, opracowane przez The National Committee of Inquiry into Higher Education" (The Recommendations of the National Committee of Inquiry into Higher Education Addressed to the British Government). In: *„Współpłatność za studia dzienne - część druga"* (Mixed, Public and Private, Financing of Intra-mural Studies - part II), (Ed. J. Woźnicki), pp. 83-92, Program Reformy Szkolnictwa Wyższego i Badań Naukowych, Instytut Spraw Publicznych, Warsaw 1998, (ISBN 83-86917-46-6).

[Pub6] T. Morawski, W. Gwarek: – Pola i fale elektromagnetyczne (Electromagnetic Fields and Waves), Wydawnictwa Naukowo Techniczne , Warsaw 1998, 304 pp. (Edition 3, extended), (ISBN 83-204-2238-8).

[Pub7] A. Przelaskowski: „Miary jakości" (Quality measures for Images), Chap.4, pp. 111-142. In: *„Multimedia - Algorytmy i Standardy Kompresji"* (Multimedia - Algorithms and Standards for Compression), (Ed.: W. Skarbek), Akademicka Oficyna Wydawnicza PLJ (Academic Publishing House), Warsaw 1998 (ISBN 83-7101-385-X).

[Pub8] W. Scharf: "Biomedical Particle Accelerators" (in Japanese), Iryo-Kapaku-Sha Ed., Tokio, 1998, 383 pp., (ISBN4-900770-66-3).

[Pub9] W. Skarbek.: „Kompresja obrazów - rozwój metod" (Image Compression – Development of Methods, Chap. 1, pp. 11-38, In: *„Multimedia - Algorytmy i Standardy Kompresji"* (Multimedia - Algorithms and Standards for Compression), (Ed.: W. Skarbek), Akademicka Oficyna Wydawnicza PLJ (Academic Publishing House), Warsaw 1998, 406 pp., (ISBN 83-7101-385-X).

[Pub10] W. Skarbek.: „Kompresja bez straty informacji" (Lossless compression), Chap. 3, pp. 69-110, In: *„Multimedia - Algorytmy i Standardy Kompresji"* (Multimedia - Algorithms and Standards for Compression), (Ed.: W. Skarbek), Akademicka Oficyna Wydawnicza PLJ (Academic Publishing House), Warsaw 1998 (ISBN 83-7101-385-X).

[Pub11] W. Skarbek: „Kwantyzacja wektorowa" (Vector Quantisation), Chap. 5, pp. 143-174, In: *„Multimedia - Algorytmy i Standardy Kompresji"* (Multimedia - Algorithms and Standards for Compression), (Ed.: W. Skarbek), Akademicka Oficyna Wydawnicza PLJ (Academic Publishing House), Warsaw 1998 (ISBN 83-7101-385-X).

[Pub12] W. Skarbek: „Metoda fraktalna" (Fractal Method), Chap. 6, pp. 175-206, In: *„Multimedia - Algorytmy i Standardy Kompresji"* (Multimedia - Algorithms and Standards for Compression), (Ed.: W. Skarbek), Akademicka Oficyna Wydawnicza PLJ (Academic Publishing House), Warsaw 1998 (ISBN 83-7101-385-X).

[Pub13] W. Skarbek: „Standard JPEG" (JPEG Standard), Chap. 8, pp. 257-182, In: *„Multimedia - Algorytmy i Standardy Kompresji"* (Multimedia - Algorithms and Standards for Compression), (Ed.: W. Skarbek), Akademicka Oficyna Wydawnicza PLJ (Academic Publishing House), Warsaw 1998 (ISBN 83-7101-385-X).

[Pub14] W. Skarbek: „Standardy MPEG-1 i MPEG-2" (MPEG-1 and MPEG-2 Standards), Chap. 10, pp. 297-336, In: *„Multimedia - Algorytmy i Standardy Kompresji"* (Multimedia - Algorithms and Standards for Compression), (Ed.: W. Skarbek), Akademicka Oficyna Wydawnicza PLJ (Academic Publishing House), Warsaw 1998 (ISBN 83-7101-385-X).

[Pub15] W. Skarbek: 'Kompresja a klasyfikacja obiektów" (Compression versus Object Classification), Chap. 12, pp. 355-381, In: *„Multimedia - Algorytmy i Standardy Kompresji"* (Multimedia - Algorithms and Standards for Compression), (Ed.: W. Skarbek), Akademicka Oficyna Wydawnicza PLJ (Academic Publishing House), Warsaw 1998 (ISBN 83-7101-385-X).

6.2. Scientific and technical papers in journals

[Pub16] A. Abramowicz, K. Derzakowski, J. Krupka: "Comments on "Study of Whispering Gallery Modes in Double Disk Sapphire Resonators", *IEEE Transactions on Microwave Theory and Techniques, Vol.46, No.5, (May 1998),* p. 566.

[Pub17] Adeva (B. Adeva,..., K. Zaremba, et al.) „Spin asymmetries A1 and structure functions g1 of the proton and the deuteron from polarized high energy muon scattering", *Physical Revue D(1998),* pp. 112001-1-112001-26.

[Pub18] Adeva (B. Adeva,..., K. Zaremba, et al.), „Measurement of proton and nitrogen polarization in amonia and test of equal spin temperature", *Nuclear Instruments and Methods A419 (1998),* pp. 60-69.

[Pub19] Adeva (B. Adeva,..., K. Zaremba., et al.), „A next-to-leading order QCD analysis of the spin structure function g1", *Physical Revue D(1998),* pp. 112002-1-112002-22.

[Pub20] Adeva (B. Adeva,..., K. Zaremba., et al.), „Polarised quark distributions in the nucleon from semi-inclusive spin asymmetries", *Physics Letters B420, (1998),* pp. 180-190.

[Pub21] S. A. Avramienko,...., J. Mirkowski, Z. Pawłowski, A. Piątkowski i inni: „Magnitynyj spektrometer GIBS" (Magnetic Spectrometer GIBS), *Report of Joint Institute for Nuclear Research Dubna, P13-98-111,* pp. 1-16.

[Pub22] S. A. Avramenko,...., J. Mirkowski, Z. Pawłowski, A. Piątkowski i inni: Topologicheskije charaktieristiki reakcji pieriezariadki $3^H \rightarrow$ 3He na uglierodie pri 6 GeV/s i 9 GeV/s(Topological Characteristics of the Charge Exchange Reaction 3H - 3He on Carbon Target at a Beam Moments of 6 GeV/s i 9 GeV/s, Report of Joint Institute for Nuclear Research Dubna, P1-98-350 pp.1-6.

[Pub23] V. Brygilewicz, J. Wojciechowski, „Time-domain fault diagnosis of analog circuits in the presence of noise", *IEE Proc. Circuits, Devices and Systems,. Vol.145, No.2, 1998,* pp. 125-131.

[Pub24] V. Brygilewicz, J. Wojciechowski, „Diagnosis of analog multi-phenomena systems", *Bull. Polish Academy of Sciences*, *Vol. 46, No.4, 1998,* pp. 487-499.

[Pub25] G. Domański, B. Konarzewski, Z. Pawłowski, J. Marzec, K. Zaremba: „Digital radiographic photodensitometry in diagnostics of osteoporosis", *Biocybernetics and Biomedical Engineering, Vol.18, No. 1-2* (1998), pp. 5-17.

[Pub26] M. Głuszek, B. Kwiatkowski: „Komputerowe wspomaganie systemu jakości" *Ekonomia i organizacja przedsiębiorstwa", vol. 7 (582), (July 1998), pp. 21-23.*

[Pub27] B. Konarzewski, Z. Pawłowski, G. Domański, J. Marzec, A. Sawicki, K. Zaremba, „A novel application of gamma scattering techniques for determining bone density in osteoporosis" , *Biocybernetics and Biomedical Engineering, Vol.18, No. 1-2* (1998), pp. 35-48.

[Pub28] J. Krupka, K. Derzakowski, B. Riddle, J. Baker-Jarvis: "A Dielectric Resonator for Measurements of Complex Permittivity of Low Loss Dielectric Materials as a Function of Temperature", *Measurement Science and Technology, Vol. 9, Issue 10, UK (October 1998),* pp. 1751-1756.

[Pub29] Z. Kulka: „Cyfrowy korektor brzmienia DG-28 Accuphase" (Accuphase – Digital Voicing Equalizer DG-28*), SAT-Audio-Video, No.7/8, 1998,* pp. 14-18.

[Pub30] Z. Kulka: „DAD czy DSD – nowym standardem dźwięku cyfrowego o dużej rozdzielczości" (DAD or DSD will become the standard of high-resolution audio), *SAT-Audio-Video, No.11, 1998,* pp. 62-67.

[Pub31] Z. Kulka: „DP-90/DC-91 Accuphase – rozdzielony odtwarzacz CD klasy high-end" (Accuphase, high-end, separate-type CD Player DP-90/DC-91), *SAT-Audio-Video, No.3, 1998,* pp. 19-22.

[Pub32] Z. Kulka: „Evolution – nowe mikrofony dynamiczne Sennheisera" (Evolution - New Sennheiser's dynamic microphones), *SAT-Audio-Video, No.7/8, 1998,* pp. 74-75.

[Pub33] Z. Kulka: „I^2S·Enhanced – interfejs cyfrowy audio" (I^2S·Enhanced – Digital Audio Interface) (Parts 1-2), *SAT-Audio-Video (1998), No.9,* pp.14-16*; No.10,* pp. 77-80.

[Pub34] Z. Kulka: "Photokina'98", *SAT-Audio-Video, No.12, 1998,* pp. 68-72.

[Pub35] Z. Kulka: "Pierwsza w Polsce prezentacja grających paneli NXT" (New NXT loudspeakers – first presentation in Poland), *SAT-Audio-Video, No.5, 1998,* pp. 22-23.

[Pub36] Z. Kulka: „Przetworniki sigma-Delta a/c i c/a" (Sigma-Delta Analog-to-Digital and Digital-to-Analog Converters) (Parts 6-10), *SAT-Audio-Video Journal (1998), No.1,* pp. 73-76*; No.2,* pp. 70-73*; No.4,* pp.78-81*; No.5,* pp. 73-77*; No.6,* pp. 74-78.

[Pub37] Z. Kulka: „Psychoakustyczny system wzbogacania niskich tonów Ultra Bass" (Ultra Bass*), SAT-Audio-Video, No.10, 1998,* pp. 68-70.

[Pub38] Z. Kulka et al., „Detektor „znakujący" w eksperymencie NA 48 w CERN mającym na celu pomiar parametru niezachowania parzystości ładunkowej" (9the tagging detector of the CP-violation experiment NA48 at CERN), NIM, A 419 (1998), pp. 623-631

[Pub39] M. H. Listewnik, J. Klonek, E. Słowińska, P. Brzeski, M. Słupecka, „Scyntygrafia planarna (SMG) sutków u chorych z "gorącym sutkiem" (Planar Scintigraphy of nipples in patients with a "hot" nipple), *Problemy Medycyny Nuklearnej, Warsaw 1998, Vol. 12 (23),* p. 90.

[Pub40] J. Modzelewski: „Optimum and Suboptimum Operation of High-Frequency Class-D Zero-Voltage-Switching Tuned Power Amplifier", *Bulletin of the Polish Academy of Sciences, Vol. 46, No. 4, Warsaw 1998,* pp. 458-473.

[Pub41] R. Z. Morawski: „Zapobiec kryzysowi" (ang.: „To Avert the Crisis"). *Forum Akademickie, Nr 6, 1998,* pp. 40-42.

[Pub42] A. Przelaskowski; „Details Preserved Wavelet-based Compression with Adaptive Context-Based Quantisation", *Fundamenta Informaticae*, vol. *34(4), 1998,* pp. 369-388.

[Pub43] R. Sikora, W. Skarbek: „Stability Analysis of Oja-RLS Learning Rule",. *Fundamenta Informaticae, vol. 34, no. 4, July 1998,* pp. 441-453.

[Pub44] W. Skarbek: „Analysis of Fractal Operator Convergence by Graph Methods", *Fundamenta Informaticae, Vol. 34, No. 4, July 1998,* pp. 429-440.

[Pub45] W. Skarbek, R. Sikora, A. Pietrowcew: Modified Oja-RLS Algorithm – Stochastic Convergence Analysis and Application for Image Compression. *Fundamenta Informaticae, Vol. 35, No. 4, December 1998,* pp. 11-31.

[Pub46] L. Szczeciński, R. Z. Morawski, A. Barwicz, „Variational Algorithms for Spectrogram Correction Based on Entropy-like Criteria", *J. Chemometrics, Vol. 12, Issue 6, 1998,* pp. 397 - 403.

[Pub47] L. Szczeciński, R. Z. Morawski, A. Barwicz: „Numerical Correction of Spectrometric Data Using a Rational Filter", *J. Chemometrics, Vol. 12, Issue 6, 1998,* pp. 379 - 395.

[Pub48] J. Wojciechowski, B. Sawionek, Z. Michalski, J. Vlach: „Symbolic large-signal simulation of switched circuits", *Circuits, Systems and Signal Processing, Vol.17, No.3, 1998,* pp. 321-334.

[Pub49] J. Wojciechowski: „Stanisław Bellert 1924-1976 - w dwudziestolecie śmierci", (Stanisław Bellert - in memoriam), *Nauka, No.4, 1998,* pp. 229-232.

6.3. Scientific and technical papers in conference proceedings

[Pub50] A. Abramowicz, K. Derzakowski: „New Models of Coupling Between Resonator and Transmission Line", *Proc. Asia-Pacific Microwave Conference,* (Yokohama, December 8-11, 1998), pp.1371-1374.

[Pub51] M Ben Slima, R. Z. Morawski, A. W. Kraszewski, A. Barwicz, S. O. Nelson: „Calibration of a Microwave System for Measuring Grain Moisture Content", *Proc. IEEE Instrum. & Meas. Technol. Conf. IMTC'98* (St. Paul, USA, May 18-21, 1998), pp. 642-647.

[Pub52] B. Błagitko, V. Brygilewicz, V. Rabyk, J. Wojciechowski: „Diagnosis of dynamic analog circuits without ambiguity problems", *Proc. XXIst National Conference on Circuit Theory and Electronic Systems - XXI KKTOiUE* (Poznań-Kiekrz, Poland, October 22-24, 1998), Vol. 1, pp. 243-248.

[Pub53] P. Bobiński, W. Winiecki: „Metodyka projektowania programowych sterowników przyrządów pomiarowych dla zintegrowanych środowisk programowych LabWindows/CVI i LabView*",* (Methodology for Development of Instruments Drivers in Integrated Environments LabWindows/CVI and LabView), *Materiały Krajowego Kongresu Metrologii KKM'98* (Gdańsk, Poland, September 15-18, 1998*),* Ed.: Komitet Organizacyjny KKM'98, Gdańsk 1998, pp. 12-20.

[Pub54] P. Brzeski, D. Ćwiek, K. Kędzior, K. Skalski, W. Smolik, R. Szabatin, W. Święszkowski: „Application of X-ray Computer Tomography to an Anthropometric Study of Elbow Joint Bones", *Proceedings of 8-th IMEKO BMI'98*, (Dubrownik, Croatia, September 16-19, 1998) pp. 10-13.

[Pub55] M. Celuch-Marcysiak, M. Sypniewski, W. K. Gwarek: „A hybrid differential / mode filtering technique for FDTD analysis of dual-polarization antenna feeds", Proc. *IEEE Antenna Propag. Symp. Dig.*, (Atlanta, June 23-25, 1998), pp. 570-573.

[Pub56] M. Celuch-Marcysiak, M. Sypniewski, W. K. Gwarek: „Improvements to parameter extraction techniques for FDTD simulations of handset antennas", Proc. *IEEE Antenna Propag. Symp. Dig.*, (Atlanta, June 23-25, 1998), pp. 550-553.

[Pub57] M. Celuch-Marcysiak, W. K. Gwarek, M. Sypniewski: „A simple and effective approach to FD-TD modelling of structures including lossy metals", *Proc of the 1998 Asia-Pacific Microwave Conf.*, (Yokohama, December 8-11, 1998), pp. 991-993.

[Pub58] M. Celuch-Marcysiak, W. K. Gwarek: „Improved excitation model for FD-TD analysis of mobile phone antennas", *12th Int. Microwave Conf. MIKON-98*, (Kraków, Poland, May 20-22, 1998), Vol.2, pp. 355-359.

[Pub59] M. Celuch-Marcysiak, W. K. Gwarek: „Consistent distributed modelling of lumped sources and loads in FDTD", *1998 Asia-Pacific Microwave Conf.*, (Yokohama, December 8-11, 1998), pp. 199-202.

[Pub60] M. Celuch-Marcysiak: „Progress in time-domain electromagnetic modelling", 12th Int. Microwave Conf. MIKON-98, (Kraków, Poland, May 20-22, 1998), Vol.3, pp. 327-334.

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[Rep4] T. Buczkowski, D. Janusek, T. Kosiło, P. Sokołowski: „*Bezpieczna radiowa transmisja danych o zasięgu lokalnym - zdalny odczyt stanu liczników"* (Secure Short-range Radio Data Transmission - Remote Meter Reading)., Final report for PAFAL S.A., Institute of Radioelectronics, WUT, December 1998, 35 pp.

[Rep5] T. Buczkowski, K. Czerwiński, T. Kosiło, D. Janusek: „*Przeprowadzenie próbnej emisji telegramów radiowego sterowania mocą w energetyce z nadajnika w Radomiu" (*Experimental Broadcasting of Electric Power Management Commands from the Long-wave Transmitter Located in Radom*), Final report for Margot Engineering*, Institute of Radioelectronics, WUT, December 1998, 30 pp.

[Rep6] M. Celuch-Marcysiak, W. Gwarek, M. Sypniewski, A. Więckowski *„Analiza możliwości sprzężenia trówymiarowych symulacji elektromagnetycznych z zero i jedno-wymiarowymi symulacjami"* (Investigation of Possibilities to Couple Three-dimensional Electromagnetic Simulation with Zero- and One-dimensional Nonlinear Simulation), Final report for Dean grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 26 pp.

[Rep7] K. Derzakowski, J. Modelski: „*Nowa metoda identyfikacji rodzajów drgań w strukturach rezonansowych o niejednorodnym wypełnieniu"* (The New Method for Identification of Modes in Resonant Inhomogeneously Filling Structures), Final report for statutory project, Institute of Radioelectronics, WUT, Warsaw, March 1998, 67 pp.

[Rep8] J. Ebert, M. Mikołajewski, J. Modzelewski, A. Owczarek: *„Optymalizacja rezonansowych wzmacniaczy mocy wielkiej częstotliwości klasy D" (Optimisation of High-Frequency Class-D Tuned Power Amplifiers*),), Final report for statutory project, Institute of Radioelectronics, WUT, Warsaw, March 1998, 19 pp.

[Rep9] W. Gwarek, A. Abramowicz, T. Ciamulski, „*Wyznaczenie rozkładów pól elektromagnetycznych i charakterystyk transmisji i odbicia dla wzorcowych symetrycznych otwartych linii paskowych"* (Determination of Electromagnetic Field Distribution and Transmission and Reflection Characteristics for Open TEM Cells), Final report for CIOP, Institute of Radioelectronics, WUT, Warsaw, November 1998, 53 pp.

[Rep10] J. Jarkowski, J. Modelski, E. Yaszczyszyn: *„Synteza i optymalizacja mikrofalowej anteny paskowej z falą bieżącą"* (Synthesis and Optymizing of the Radiation Pattern of a Finite Grating Integrated with a Planar Dielectric Waveguide), Final report for Dean grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 13 pp.

[Rep11] M. Kazubek, A. Przelaskowski, T. Jamrógiewicz, J. Mirkowski, L. Padee: *„Trójwymiarowa rekonstrukcja naczyń krwionośnych w oparciu o dane ze skanera z głowicą liniową 1D i systemem Power Doppler"* (3D Vascular Imaging from Linear 1D Transducer and Power Doppler System), Final report for priority grant, Institute of Radioelectronics, WUT, Warsaw, June 1998, 12 pp.

[Rep12] M. Kazubek, A. Przelaskowski, T. Jamrógiewicz: *„Metody określania diagnostycznej wiarygodności obrazów medycznych* (Methods For Determining Diagnostic Accuracy Of Lossy Compressed Medical Images), Final report for Dean grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 9 pp.

[Rep13] M. Kazubek, T. Jamrógiewicz, A. Przelaskowski, J. Mirkowski, L. Padee *„Metody radiacyjne w technikach medycznych / Stereowizja rentgenowska* (Radiation Techniques in Medicine / X-ray Stereopresentation), Final report for statutory grant, Institute of Radioelectronics, WUT, Warsaw, March 1998, 7 pp.

[Rep14] A. Leszczyński, M. Tajchert, J. Paluchowski, A. Aronowski: „*Laboratoryjny system do nagrań i obróbki dźwięku"* (System of Sound Recording and Studio Production), Final report for Dean grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 19 pp.

[Rep15] J. Marzec, K Zaremba, Z. Pawłowski, B. Konarzewski *„Straw Tubes Electrical*

Properties", COMPASS Note 1998-10, 15 October 1998, Internal report CERN, 42 pp.

[Rep16] J. Marzec, K. Zaremba, Z. Pawłowski, B. Konarzewski, *„Liczniki słomkowe dla eksperymentu COMPASS (CERN). Wyniki badań*" (Straw Tubes for the COMPASS Experiment. Research results), Annual report SPUB, Warsaw, June 1998, 44 pp.

[Rep17] A. Miękina, P. Kluk: *„Zastosowanie wariacyjnych metod estymacji parametrów oraz sieci neuronowych do statycznego wzorcowania dielektrometru mikrofalowego*" (Application of Variational Methods of Parameter Estimation and Neural Networks for Static Calibration of Microwave Dielectrometer"). Final report for Dean grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 16 pp.

[Rep18] A. Mikołajewski: *„Analiza i optymalizacja układów regulatorów synchronicznych wielkiej częstotliwości",* (Analysis and Optimisation of HF Synchronous Regulators), Final report for Rector grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 39 pp.

[Rep19] M. Mikolajewski, J. Ebert, J, Modzelewski, A. Owczarek, K. Puczko, K. Radecki: *„Nowe rozwiązania wysokosprawnych układów syntezy przebiegów wolnozmiennych mocy z wykorzystaniem układów wielkiej częstotliwości"* (Novel High-Efficiency High-Frequency Circuits for Synthesising Low-Frequency Power Waveforms), Final report for KBN grant No 8T11B 004 13, Warsaw, November 1998, 128 pp.

[Rep20] J. Mirkowski, M. Kazubek, L. Padee, T. Jamrógiewicz *„Transmisja obrazów medycznych dla potrzeb telediagnostyki* (Transmision of Medical Images for Telediagnosis systems), Final report for Dean grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 4 pp.

[Rep21] J. Mirkowski, Z. Pawłowski, A. Piątkowski i inni *„Magnetic Spectrometer GIBS"* raport Joint Institute for Nuclear Research, P13-98-111, 16 pp.

[Rep22] J. Modelski, A. Buchowicz, Z. Kozłowski, J. Kondarewicz, T. Krzymień, J. Marzyjanek, M. Pietraszek, T. Smakuszewski: *„Metody analizy i projektowania układów i systemów telewizyjnych "* (Methods of Analysis and Design of TV Circuits and Systems), Final report for statutory grant, Institute of Radioelectronics, WUT, Warsaw, March 1998, 15 pp.

[Rep23] R. Z. Morawski: *„Organizacja działalności sprawozdawczej i promocyjnej na dużym wydziale szkoły wyższej"* (Organisation of Reporting and Promotion Activities at a Large Faculty of the University), Final report for statutory grant (No 504/030/024/7), WUT, Warsaw, April 1998, 40 pp.

[Rep24] R. Z. Morawski: *„Problematyka inżynierii kształcenia technicznego w działalności rozwojowej zagranicznych instytucji akademickich i w pracach organizacji międzynarodowych związanych ze szkolnictwem wyższym"* (Engineering Education in the Activities of International Organisations Related to Higher Education). Final report for Dean grant (No: 503/030/025/7), WUT, Warsaw, May 1998, 40 pp.

[Rep25] R. Z. Morawski: *„Realizacja i badanie wybranych algorytmów interpretacji danych pomiarowych"* (Implementation and Investigation of the Selected Algorithms for Interpretation of Measurement Data*)*. Final report for statutory grant (No. 504/034/MOR/7), Institute of Radioelectronics, WUT, Warsaw, March 1998, 30 pp.

[Rep26] T. Morawski, J. Zborowska, W. Wojtasiak, D. Gryglewski, R. Michnowski, M. Kukier: *„Projektowanie dyspersyjnych linii niejednorodnych i sprzężonych do mikrofalowych madulatorów fazy"* (Design of Disspersive Nonuniform and Coupled Lines for Microwave Phase Modulators), Final report for Rector grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 44 pp.

[Rep27] Z. Pawłowski, B. Konarzewski, J. Marzec, K. Zaremba, G. Domański *„Metodyka i aparatura do nieinwazyjnych badań gęstości tkanek kostnych i stężeń ciężkich metali toksycznych w kościach"* (Methodology and Apparatus for Noninvasive Bone Density and Toxic Metal Concentrations in Bones Measurements*)*, Final report for KBN grant, Institute of Radioelectronics, WUT, Warsaw, December 1998, 87 pp.

[Rep28] Z. Pawłowski, J. Marzec, B. Konarzewski: *„Spektroskopowa metoda badań in vivo gęstości tkanek kostnych i stężeń ciężkich metali toksycznych w kościach"* (Spectroscopic Method for in vivo Measurements of Bone Density and Toxic Metals Concentrations in Bones), Final report for Rector grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 116 pp.

[Rep29] A. Piątkowski, P. Bogorodzki, E. Piątkowska-Janko, J. Wasielewski, A. Wasilewski: *„Hybrydowa metoda korekcji niejednorodności pola głównego dla potrzeb tomografii magnetycznego rezonansu jądrowego",* (Hybrid Correction of Magnetic Field Inhomogeneities for Magnetic Resonance Imaging Purposes), Final report for Rector grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 11 pp.

[Rep30] A. Piątkowski, P. Bogorodzki: *„Obrazowanie udaru mózgowego za pomocą tomograficznych badań dynamicznych"* (The Method for the Brain Stroke Imaging Based on Dynamic Scanning Protocols), Final report for Dean grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 7 pp.

[Rep31] A. Podgórski, R. Z. Morawski, A. Miękina: *„Zastosowanie procesorów sygnałowych w wybranej aparaturze do pomiaru i analizy hałasu i drgań”.* (Application of Digital Signal Processors in the Selected Instrumentation for Noise and Vibration Measurement and Analysis), Final report for Dean grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 20 pp.

[Rep32] A. Przelaskowski: *„Nowy algorytm kompresji obrazów z wykorzystaniem adaptacyjnych modeli transformaty wavelet”* (Novel adaptive wavelet-based algorithm for image data compression), Final report for Dean grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 26 pp.

[Rep33] W. Skarbek, K. Ignasiak, B. Dudzinski, R. Pająk: „Analiza Tekstur Nowych materiałów metodą Lokalnej Analizy Składowych Głównych”(Texture Analysis of New Materials by Local Principal Component Analysis), Final report of New Materials Rector’s grant in WUT, June 1998, 23 pp.

[Rep34] W. Skarbek: „*Optymalizacja Algorytmów kompresji obrazów”* (Optimisation of Image Compression Algorithms), Final report for KBN grant, January 1998, 20 pp.

[Rep35] W. Winiecki, K. Adamowicz, R. Leoniak, R. Łukaszewski, G. Ciasnocha: *„Projektowanie rozproszonych systemów pomiarowych z wykorzystaniem sieci komputerowych IEC-625”* (Measuring System Controlling via Computer Network), Final report for Dean grant, Institute of Radioelectronics, WUT, Warsaw, May 1998, 12 pp.

8. HOME PATENTS

[Pat1] M. Mikołajewski: „*Prostownik synchroniczny z transformatorem”,* Patent RP, PL 174 595 B1, 31.08.1998.

9. CONFERENCES, SEMINARS AND MEETINGS

9.1 International conferences

[Con1] *12th European Frequency and Time Forum*, (Warszawa, Poland, March 10-12, 1998) J. Cichocki (participant), K Radecki (speaker)

[Con2] *IEEE Instrumentation and Measurement Technology Conference - IMTC'98* (St. Paul, USA, May 18-21, 1998*)*, R. Z. Morawski (speaker).

[Con3] 8th International Congress on Holter and Noninvasive Electrocardiology (Ulm, Germany, May 21-23, 1998), E. Piątkowska-Janko (participant), A. Piątkowski (chairman).

[Con4] *XII-th International Microwave Conference MIKON-98,* (Kraków, Poland, May 20-22, 1998), T. Morawski (*member of Technical Program Committee,* session chairman), W. Gwarek (participant, session chairman, member of the TPC), J. Modelski (chairman of the TPC speaker) M. Celuch-Marcysiak (speaker), J. Jarkowski (speaker), W. Kazubski (speaker), K. Kurek (speaker), M. Konwicki, K. Derzakowski.

[Con5] *11th International Conference on Noise Control* (Krynica, Polska, June 2-4, 1998), E. Kotarbińska (speaker), A. Podgórski (speaker).

[Con6] *III Międzynarodowe Sympozjum Naukowo-Technicznego – Nowe kierunki technologii i badań materiałowych*: (Białowieża, June 8-10, 1998), J. Narkiewicz-Jodko (speaker).

[Con7] *IEEE Microwave Theory and Techniques Symposium* , (Baltimore, June 10-12, 1998), M. Celuch-Marcysiak (participant), W. Gwarek (speaker), J. Modelski (speaker).

[Con8] *1st ACES Workshop* (Neuchâtel, Switzerland, June 12, 1998), S. Hahn (speaker), J. Jarkowski (speaker), K. Snopek (speaker).

[Con9] First International Conference RSCTC'98, (Warsaw, Poland, June 22-26, 1998), W. Skarbek (session chairman and speaker).

[Con10] 11th International Congress Cardiostim '98, Nice, June 17-20, 1998, D. Janusek (speaker).

[Con11] *IEEE Antennas and Propagation Symposium,* (Atlanta, June 23-25, 1998), M. Celuch-Marcysiak (speaker), W. Gwarek (speaker).

[Con12] *14th International Wrocław Symposium on Electromagnetic Compatibility*, (Wrocław, Poland, June 24-26, 1998) J. Cichocki (participant), J. Kołakowski (speaker)

[Con13] *ASEE Annual Conference (*Seattle, USA, June 28-July 1, 1998), R. Z. Morawski (speaker).

[Con14] *6th ISMQC IMEKO Symposium "Metrology for Quality Control in Production" (*Vienna, Sept. 8-10, 1998*)*, R. Z. Morawski (speaker), A. Miękina (participant).

[Con15] *Aplikowana Elektronika 98* (Pilzno, Czech Republik, September 9-10, 1998), J. Jarkowski (speaker).

[Con16] *8th International IMEKO Conference on Measurement in Clinical Medicine, BMI'98*, (Dubrovnik, Croatia, September 16-19, 1998), W. Smolik (speaker).

[Con17] *10th International IMEKO TC-4 Symposium on Development in digital measuring instrumentation, (Naples*, Italy September 17-18 1998), J. Cichocki (speaker), J Kołakowski (speaker).

[Con18] 5th German-Russion Workshop on Image Analysis (Herrsching, Germany, September 21-26, 1998), W. Skarbek (speaker).

[Con19] *28th European Microwave Week (Amsterdam, October 5-9, 1998)*, J. Modelski (member of the TPC), (session chairmen), (speaker).

[Con20] *The IEEE-SP International Symposium on Time-Frequency and Time-Scale Analysis* (Pittsburgh, USA, October 6-9, 1998*)*, A. Przelaskowski (speaker).

[Con21] *Kleinheubacher Tagung,* (Kleinheubach, Germany, October 28. - November 02, 1998), S. Hahn (speaker), J. Jarkowski (speaker), K. Snopek (speaker).

[Con22] *International Conference EMB 98 - Electromagnetic computations for analysis and design of complex systems,* (Linkoping, Sweden, November 16-17, 1998), W. Gwarek (invited speaker, discussion panel member).

[Con23] *Information Society Technologies,* (Wien, Austria, November 30- December 3, 1998) M. Celuch-Marcysiak, M. Sypniewski (participants, IT Price recipient).

[Con24] *1998 Asia-Pacific Microwave Conference*, Yokohama, Japan, December 8-11, 1998), W. Gwarek (conference speaker, invited workshop speaker, session chairman), P. Miazga (speaker).

9.2. Local conferences

[Con25] *Podstawowe Problemy Metrologii PPM'98 (Basic Problems of Metrology), (Gliwice-Ustroń, May 6-8, 1998),* R. Z. Morawski (speaker), W. Winiecki (speaker, session chairman).

[Con26] *IV Ogólnopolska Konferencja Naukowo-Szkoleniowa nt. Zagrożenia środowiska pracy w górnictwie, rozpoznanie, ocena i zwalczanie* (Katowice-Ustroń, May 12-15, 1998), E. Kotarbińska (speaker).

[Con27] *Krajowa Konferencja Radiodyfuzji i Radiokomunikacji*, (Poznań, May 18-20, 1998),J. Modelski (member of the TPC,

session chairman, speaker) J. Cichocki, J. Kołakowski, K. Radecki, T. Kosiło, (participants), J. Wojciechowski (speaker),.

[Con28] *V Konferencja „Światłowody i ich zastosowania",* (Białowieża, Jan. 22-24, 1998), A. Leszczyński (speaker).

[Con29] *IX Konf. Naukowa „Sterowanie i Regulacja w Radiolokacji i Obiektach Latających"*, (Jelenia Góra, June 16-18), W. Wojtasiak (speaker).

[Con30] *XXX Międzyuczelniana Konferencja Metrologów MKM'98 (XXX Inter-University Metrologists' Conference), (Międzyzdroje, September 2-4, 1998),* W. Winiecki (speaker, session chairman, member of the Scientific Committee), R. Łukaszewski (speaker).

[Con31] *Krajowy Kongres Metrologii KKM'98 (Metrology National Congress), (Gdańsk, September 15-18, 1998),* R. Z. Morawski (member of the Programme Committee), W. Winiecki (speaker, session chairman), P. Bobiński (speaker), J. Ebert (participant).

[Con32] *Tomografia rentgenowska Warsztaty pt. „Tomografia procesowa - podstawy i zastosowania", Wydziału Uzbrojenia i Lotnictwa, Wojskowa Akademia Techniczna*, (September 22 - 25 1998) W. Smolik.

[Con33] *VI Zjazd Naukowy Polskiego Towarzystwa Medycyny Nuklearnej*, (Łódź, September 23-25, 1998), P. Brzeski (speaker), R. Szabatin (participant).

[Con34] *Application of Microprocessors in Automatic Control and Measurement, Proceedings, XI Konferencja,* (Warszawa, PIE, October 13-14, 1998), J. Narkiewicz-Jodko (speaker).

[Con35] *XXIst National Conference on Circuit Theory and Electronic Systems - XXI KKTOiUE (Poznań-Kiekrz, October 22-24, 1998),* M. Mikołajewski (speaker), J. Modzelewski (speaker).

[Con36] Fifteenth International Conference, (Denton, Texas, November 1998), W.Wieszczycka (speaker)

[Con37] *Krajowe Sympozjum Telekomunikacji KST'98,* Bydgoszcz, September 9-11, 1998, S. Hahn (member of the TPC), J. Modelski (member of the TPC), M. Konwicki (participant).

9.3. Schools, seminars and meetings

[Con38] *Seminarium naukowe Komisji Kształcenia Komitetu Metrologii PAN (Scientific Meeting of the Education Section of the Metrology and Instrumentation Committee , Polish Academy of Science), (Ustronie k/Kępna, January 6-8, 1998),* W. Winiecki (participant)

[Con39] *Seminar' Géstion Universités - Pays Associés'* (Paris, France, January 29-31, 1998), R. Z. Morawski, (participant).

[Con40] *National Radio Astronomy Observatory* Seminar *(Charlottesville*, USA June 18-19, 1998), M. Celuch-Marcysiak (speaker), W. Gwarek (speaker).

[Con41] *V Międzynarodowe Seminarium Ergonomii, Bezpieczeństwa Pracy* (V Int. Seminar on Human Ergonomy), (Lublin October 28, 1998), E. Kotarbińska (speaker).

[Con42] „ELECTRONICA 98", *(Messe München Gmbh, Germany, November 10-15, 1998),* D. Janusek, T. Kosiło, T. Buczkowski (participants*)*.

[Con43] *Chalmers University of Technology*, (Sweden, November 18-20, 1998), Seminar: „Towards easier & faster application of electromagnetic software for microwave & millimeter wave problems", M. Celuch-Marcysiak (speaker & consultant), W. Gwarek (consultant).

[Con44] *„Studia płatne, czy nie ?" (Warszawa, SGH, December 2, 1998)*, R. Z. Morawski (speaker).

[Con45] *XLV Otwarte Seminarium z Akustyki*, (Poznań-Kiekrz, September 15-18, 1998), M. Tajchert (speaker).

10. STATISTICAL DATA

SPECIFICATION	1997	1998	DIFFERENCE
academic staff total	85,5	86,5	+1
professors with title	6	6	0
professors	5	5	0
assistant professors	32,5	38,5	+6
senior lecturers	4	5,30	+1,30
lecturers	3	2,90	-0,10
assistants	9	3,00	-6
Ph.D. students	26	36	+10`
technical staff	15,25	15,00	-0,25
administrative staff	8	9	+1
other staff	2	3	+1
space total	2415,1	2415,1	0
laboratories	1038,3	1038,3	0
library	71,2	71,2	0
offices of academic staff	1305,6	1305,6	0
computers total	164	218	+54
workstations	4	4	0
personal computers (PC 486 and better)	160	214	+54
library resources			
books (number of volumes)	12657	12866	209
books (number of titles)	7251	7418	167
journals (number of titles subscribed to)	26	30	4
teaching activities			
basic courses	36	37	+1
advanced courses	39	50	+11
other courses	20	11	-9
international projects	4	3	-1
research projects total	63	62	-1
granted by the University	23	25	+2
granted by the State institutions	12	10	-2
other projects	28	16	-12
degrees awarded			
Ph.D. degrees	4	6	+2
M.Sc. degrees	46	63	+17
B.Sc. degrees	0	3	+3
publications total	111	120	+9
sci.-tech. books and chapters in books	7	15	+8
sci.-tech. papers in journals	30	34	+4
sci.-tech. papers in conference proceedings	72	69	-3
textbooks	1	2	+1
other publications	1	34	+33
research reports	21	35	+14
patents			
patents granted	1	1	0
patent application	0	1	+1
conferences			
number of conferences attended by the staff	35	37	2
number of participants from the Institute	77	62	-15