WARSAW UNIVERSITY OF TECHNOLOGY

FACULTY OF ELECTRONICS AND INFORMATION TECHNOLOGY

INSTITUTE OF RADIOELECTRONICS

ANNUAL REPORT

1997

Warsaw, April 1998

Edited by:

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From the Director

For the second time we are presenting the Annual Report of the Institute of Radioelectronics in English, The report gives a comprehensive overview of our research and teaching activities during the year, with presentation continued in the same format as in 1996. It was in 1997 that we revamped our communication strategy, focusing on well-structured information wherefrom an interested reader could easily extract the relevant data. We hoped that by communicating more effectively, we would attract more attention to our educational as well as R&D offer. And indeed, we have received a lot of positive feedback. This year we pride ourselves on our strengthening links with the Polish industry as well as with foreign educational and commercial partners.

It is always hard to know what gives any institution its potential and flavour. It is even harder to convey this in a synthetic report. Of necessity, the Annual Report provides only an introduction to our activities, and essential quantitative information on our 63 conducted projects, 95 offered courses, and 111 published papers. Unfortunately, there is a danger that details and numbers can take over, while our rationale and driving ideas become obscured instead of highlighted. Thus in this introductory message I would like to emphasize our long-term objective that resides in doing result-oriented and innovative research, relevant from the viewpoint of industrial and social demands. Through this research we enhance the quality of offered courses and awarded degrees.

Please also take a note of our unusually broad subject coverage. We address a wide variety of issues from the physics of wave propagation and mathematics of signal theory to prototype production of radio engineering equipment. We work in the domains of electroacoustics and electromagnetics, nuclear and biomedical engineering, radiocommunications and television, signal processing and monitoring systems. This diversification of interests allows us to offer our students multi-facet education that will stand them in good stead in the dynamic world of science and technology.

Our mission is to educate young people, and not just train them in one discipline within the field of radioelectronics. We encourage interdisciplinary studies. We put our students in touch with experts and most up to date ideas, give them responsibilities in laboratories, and promote creativity in individual projects.

The success of our recent graduates in finding satisfying careers is important, and we are happy to see them in high demand across a widening range of positions in industry, academia, and public service. Many challenging job offers have been nurtured through the Institute's commercial projects and consultancy, and we believe that many more will come up this way in the future. But we are also happy to see professionals who return to study long after leaving full-time education. Our programme of continuing education includes part-time studies on radiocommunications. postgraduate courses on radiocommunications, and short courses on radiocommunications, electroacoustics and biomedical engineering. The offer of focused courses has particularly expanded over this year, thanks to the increased interest and support by the Polish leading mobile communication companies. The courses stimulate more free and open information flow between university and commerce, and this helps us play a vital role in the country current affairs.

Year 1997 was for us another successful year both in research and education - foundation of a new student laboratory "Multimedia Techniques" being just one of our important accomplishments. We hope that this report gives a convincing summary, and also an intriguing picture of the potential and involvement of the Institute of Radioelectronics in the many fields of science and engineering. We will appreciate your feedback and we will be glad to answer further questions. We will be pleased, upon request, to send you reprints of our papers and reports.

Warsaw, April 1998

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

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Contents

This Annual Report summaries the research
activities of the Institute in 1997, as well as
the teaching activities of the academic year
1996/97

1. GENERAL INFORMATION

1.1. Mission of the Institute

Anchored in the rapidly expanding world of science and engineering, the Institute of Radioelectronics perceives its mission in doing result-oriented, industry-related and innovative research. It applies its staff talents to contemporary problems posed by an increasingly technological society, and seeks excellence in academic programmes preparing its students for a variety of engineering and leadership positions in industry, academia, and public service. For three decades, the Institute has built up a high level of competence on the many physical, mathematical, technological and biomedical aspects of radioelectronics. Such a wide field of R&D interests is unique, and locates the Institute of Radioelectronics at a special position within the Faculty.

In the scientific field, the following key research objectives are pursued:
- 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.

The Institute's researchers publish over a hundred scientific papers yearly, most of them in reviewed Polish and foreign journals and in international conference proceedings. The scientific accomplishments of several research groups have gained world-wide recognition exemplified by invitations to publish papers in prestigious journals as well as to present the results of their work at high-ranking European, American and Asian conferences. This recognition leads to an increasing number of links with foreign research and industrial 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). Joint projects, seminars, and exchange of students and staff ensure state-of-the-art orientation of the Institute's research.

The applied research is mainly concerned with computer aided design of radio engineering equipment, medical diagnostic equipment, and measurement systems including:
- radio communication systems,
- radiolocation antennas,
- television equipment,
- radiomonitoring systems,
- high-efficiency energy sources,
- high-power radio engineering devices,
- equipment for time and frequency services,
- biomedical instrumentation,
- measurement systems involving industry, nuclear engineering for scientific research, and medicine.

Prototypes and short series of the instrumentation are constructed. The applied research is in a large part financed by industrial projects ordered by, in particular, National Radiocommunication Agency PAR, Polish Telecommunications, National Railways as well as military institutions.

The teaching activity of the Institute of Radioelectronics encompasses undergraduate and postgraduate studies as well as continuing education. At the undergraduate level, the Institute participates in a two-stage programme of study leading to a Bachelor's or Master's degree in the following areas of concentration:
- Radio Frequency Engineering (profiles: radiocommuni-cations, electroacoustics, television, radiolocations);
- Biomedical Engineering;
- Measuring and Monitoring Systems;
- Computer Engineering.

In 1997, 46 students received their M.Sc. degrees from the Institute. The graduates can find interesting employment on the expanding Polish market in telecommunications services, mobile communications, information technology, television.

Continuing education courses are addressed to technical staff from a number of dynamically developing Polish businesses such as telecommunications network operators, mobile communication companies, banks, local and governmental organisations. The 1997 offer included:
- Part-time Studies on Radiocommunication;
- Postgraduate Course on Radiocommunication;
- Course on Basis of Digital Cellular Telephony;
- Course on Basis of Digital Cellular Telephony GSM/DCS;
- Course on Digital Cellular Telephony;
- Course on System of Cellular Telephony
- Course on Internet.

At all levels, lectures are delivered by experienced academic staff including 11 professors and 34 assistant professors. Laboratories and design seminars take advantage of the Institute's computer network, equipment, and professional software. There are over 10 student laboratories in the Institute, for example: the Radiocommunication Laboratory, Biomedical Laboratory, Measuring Systems Laboratory (equipped with Hewlett-Packard and National Instruments hardware and software), Computer Laboratory. While the above facilities are comparable to those offered by other units of the Faculty, a unique feature of the Institute of Radioelectronics consists in the measuring and production equipment available, fundamental for the Institute's engineering projects but also providing hands-on experience for its students. The equipment comprises, among others: an anechoic chamber and sound studio, a BMT-1000 MRI tomograph, an HP network analyser.

1.2. Board of Directors

Director of the Institute:
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Deputy Director for Technical Affairs
Maciej Konwicki, M.Sc., Head R&D Engineer
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1.3. Organisation of the Institute

The Institute of Radioelectronics consists of the following research and teaching divisions:
- Radiocommunications Division;
- Television Division;
- Electroacoustics Division;
- Radio Engineering Devices;
- Microwave Engineering Division;
- Piezoelectric Measurement Division (up to 30.01.1997);
- Medical and Nuclear 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
Jacek Jarkowski, Ph.D., Assist. Professor (to 30.11.97)
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Jacek Wojciechowski, D.Sc., Professor (from 1.12.97)
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Senior academic staff

Tomasz Buczkowski, Ph.D.	Assistant Professor
Krzysztof Czerwiński, Ph.D.	Assistant Professor
Tomasz Kosiło, Ph.D.	Assistant Professor
Jacek Jarkowski, Ph.D.	Assistant Professor
Karol Radecki, Ph.D.	Assistant Professor
Waldemar Kiełek, D.Sc.	Associate Professor (emeritus)
Stefan Hahn, D.Sc.	Professor (emeritus)

Junior academic staff

Henryk Chaciński, M.Sc.	Lecturer
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

Teaching activities carried out in the Radiocommunications Division cover most of basic problems in radiocommunication systems, antennas and signal processing, measurement in radiocommunication, networks. Research activities are focused on specific problems in radiocommunication such as:
- digital modulations,
- optimising methods of antenna synthesis,
- multidimensional signals theory,
- mobile systems,
- measurement in radiocommunication,
- electromagnetic spectrum monitoring,
- networks (radio and telecommunications).

Current research topics include:
- theory and applications of multidimensional complex signals,
- application of Hilbert transform for antenna radiation pattern forming and optimising,
- digital modulations broadcasting in AM bands,
- application of GDS for selected geodetic measurements,
- health and environmental aspects of electronics,
- GSM-R system for railway company,
- remote radiomonitoring,
- fault detection in electronic systems,
- design of power electronic circuits,
- simulation and design of networks.

1.3.2. Television Division

Head of Division
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e-mail: J.Modelski@ire.pw.edu.pl.

Senior academic staff

Władysław Skarbek, D.Sc.	Professor (from 1.10.97)
Andrzej Buchowicz, Ph.D.	Assistant Professor (to 14.06.97- Assistant)
Krzysztof Derzakowski, Ph.D.	Assistant Professor
Zdzisław Kozłowski, Ph.D.	Senior Lecturer (0.5) (to 31.09.97- Assist. Prof)
Marek Rusin, Ph.D.	Assistant Professor (0.5)

Junior academic staff

Jerzy Kondarewicz, M.Sc.	Lecturer
Tomasz Krzymień, M.Sc.	Assistant
Jacek Marzyjanek, M.Sc.	Assistant
Marek Pietraszek, 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
Wojciech Kazubski, M.Sc.	Ph.D. Student
Krzysztof Mroczek, M.Sc.	Ph.D. Student
Wojciech Sadowski, M.Sc.	Ph.D. Student
Grzegorz Siemek, M.Sc.	Ph.D. Student

Technical staff
Tomasz Smakuszewski, M.Sc.

Television Division conducts scientific and applied research in the area of terrestrial, satellite and cable television systems, analogue and digital components of television systems, broadcasting equipment as well as

digital image processing. A new group has started intensive activities in the multimedia area. Specific research topics in 1997 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

Zbigniew Kulka, Ph.D., D.Sc.	Assistant Professor (from 22.12.97)
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

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.

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

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.

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) (to 30.09.97 -Assist. Prof)
Wiesław Winiecki, Ph.D.	Assistant Professor

Junior academic staff

Robert Łukaszewski, M.Sc.	Assistant (from 16.06.97)
Andrzej Miękina, M.Sc.	Assistant
Piotr Kluk, 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
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
Przemysław Miazga, Ph.D.	Assistant Professor
Maciej Sypniewski, Ph.D.	Assistant Professor (from 1.03.97)
Andrzej Więckowski, Ph.D.	Assistant Professor
Jolanta Zborowska, Ph.D.	Assistant Professor

Junior academic staff

Wojciech Wojtasiak, M.Sc.	Senior Lecturer
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
Tahar Habib, M.Sc.	Ph.D. Student (to 31.03.97)
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 Robaczyński, M.Sc.
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 1997 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.

1.3.6. Piezoelectric Measurement Division
(up to 1997.09.30; since 1997.10.1 the Division has been included in the Radiocommunications Division)

Head of Division
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Senior academic staff

Jacek Cichocki, Ph.D.	Assistant Professor

Junior academic staff

Jerzy Kołakowski, M.Sc.	Assistant

Technical staff
Stanisław Żmudzin, M.Sc. (0.5)

The Division carries out intensive work in the field of radiocommunication measurement, radiomonitoring and land mobile communication. Its main interests include:
- measurement methods and techniques,
- high-frequency measuring systems intended for testing radiocommunication equipment,
- radiomonitoring methods and systems,
- cellular communication systems (GSM, TETRA).

Currently the activity is focused on:
- development of mobile radiomonitoring systems,
- training in cellular systems.

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)
Marek Karolczak, Ph.D.	Assistant Professor
Marian Kazubek, Ph.D.	Assistant Professor
Janusz Marzec, Ph.D.	Assistant Professor
Jacek Mirkowski, Ph.D.	Assistant Professor
Lech Padee, Ph.D.	Senior Lecturer (0.5) (to 30.09.97 -Assist. Prof)
Artur Przelaskowski, Ph.D.	Assistant Professor
Roman Szabatin, Ph.D.	Assistant Professor
Krzysztof Zaremba, Ph.D.	Assistant Professor
Waldemar Scharf, Ph.D.	Assistant Professor (emeritus)

Junior academic staff

Paweł Błociszewski, M.Sc.	Senior Lecturer
Tomasz Olszewski, M.Sc.	Lecturer (0.5)
Piotr Bogorodzki, M.Sc.	Assistant.
Bogumił Konarzewski, M.Sc.	Assistant
Ewa Piątkowska-Janko, M.Sc.	Assistant
Grzegorz Domański, M.Sc.	Ph.D. Student
Waldemar Smolik, M.Sc.	Ph.D. Student (to 30.11.97)
Jarosław Wasielewski, M.Sc.	Ph.D. Student

Technical and administrative staff
Marta Bukowska-Korol, M.Sc. (0.25)
Dariusz Ćwiek, M.Sc.
Tomasz Jamrógiewicz, M.Sc. (0.5)
Tomasz Olszewski, 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,
- correlated methods for the investigation of neurosystems by NMR and SPECT tomography,
- MR imaging sequence optimisation for better contrast resolution in heart and large vessels examination,
- field homogeneity in MRI tomography improvement with combined "passive" and "active" approach,
- expert systems for high resolution ECG with P-wave averaging technique,
- application of wavelet transform for echocardiographic images' quality improvement and for image data compression,
- algorithms for 3D brain imaging,
- dynamic tomographic studies (aided method of early diagnosis of brain strokes),
- digital structural radiography,
- X-ray stereoscopy.

2. STAFF

2.1. Senior academic staff

Konrad Adamowicz
M.Sc. ('64), Ph.D. ('76); measurement and instrumentation; Assistant Professor, Radio Engineering Division; Scientific Secretary of the Metrology and Instrumentation Committee, Polish Academy of Sciences ('93-'96); Member of the Education Commission of the Metrology and Instrumentation Committee, Polish Academy of Sciences ('93-'96); Member of the Measurement Committee of the Polish Society for Measurement, Automatic Control and Robotics POLSPAR ('92-); Ministry of National Education Awards in Research (1997); [Edu1], [Edu65], [Edu83]; [MSc19], [MSc27]; [Pro6], [Pro19]; [Pub38]; [Rep1]; [Con10].

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Piotr A. Brzeski
M.Sc. ('70), Ph.D. ('82); biomedical engineering; Assistant Professor, Nuclear and Medical Electronics Division; Deputy Director for Academic Affairs of the Institute of Radioelectronics ('93-); Member of the Faculty Council ('90-); Member of the Dean's Financial Committee ('93-); Member of the European Association of Nuclear Medicine ('89-); [Edu14], [Edu15], [Edu58], [Edu73]; [MSc25], [MSc32]; [Pro24], [Pro29], [Pro41], [Pro42], [Pub33], [Pub34], [Pub92], [Pub93]; [Con39].

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Andrzej Buchowicz
M.Sc. ('88), Ph.D. ('97); television, digital signal and image processing, digital television systems; Assistant Professor, Television Division; Head of the Digital Television Studies in the Television Division of the Institute of Radioelectronics ('97-), Head of the student laboratory of Television Fundamentals ('96-); [Edu12], [Edu25]; [Edu69]; [PhD2]; [MSc6]; [Pro32]; [Pub14], [Pub47]; [Con31].

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Tomasz Buczkowski
M.Sc. ('67), PhD. ('78); electronics and telecommunications; Assistant Professor, Radiocomunications Division; Head of the Electronic Aids for the Handicapped and the Elderly Laboratory; Chairman of the ITU-R (CCIR) Study Group 7 „Time & Frequency" ('83-); Member of the Scientific Advisory Board, Polish Association for the Blind; Central Bureau of Geodesy and Cartography (GUG) Award in Research; SEP Publication Award; [Edu43], [Edu72], [Edu85]; [MSc11], [MSc12], [MSc22]; [Pro1], [Pro15], [Pro33], [Pro45], [Pro48]; [Rep3].

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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); [Edu26], [Edu76]; [Pro7], [Pro21], [Pub49].

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Krzysztof Czerwiński
M.Sc. ('68), Ph.D. ('86); electronics and telecommunications; Assistant Professor, Radiocommunications Division; Vice-chairman of the ITU-R (CCIR) Study Group 7 „Time and Frequency" ('83-); Rector's Award in Research; Central Bureau of Geodesy and Cartography (GUG) Award in Research; SEP Publication Award; [Edu34], [Edu46], [Edu56], [Edu85], [Edu90]; [MSc39]; [Pro1], [Pro33], [Pro45]; [Pub50]; [Rep3]; [Con26].

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Krzysztof Derzakowski
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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
Ryszard Michnowski, M.Sc.	Ph.D. Student
Witold Mizera, M.Sc.	Ph.D. Student
Krzysztof Mroczek, M.Sc.	Ph.D. Student
Nguyen Lien Huong, M.Sc.	Ph.D. Student
Adam Osytek, M.Sc.	Ph.D. Student
Wojciech Sadowski, M.Sc.	Ph.D. Student
Błażej Sawionek, M.Sc.	Ph.D. Student
Grzegorz Siemek, M.Sc.	Ph.D. Student
Waldemar Smolik, M.Sc.	Ph.D. Student
Paweł Sokołowski, M.Sc.	Ph.D. Student
Kajetana Snopek, M.Sc.	Ph.D. Student
Tomasz Szafrański, M.Sc.	Ph.D. Student
Konrad Szustak, M.Sc.	Ph.D. Student
Tahar Habib, M.Sc.	Ph.D. Student
Andrzej Wajs, M.Sc.	Ph.D. Student
Jarosław Wasielewski, M.Sc.	Ph.D. Student

2.3. Technical and administrative staff

Marta Bukowska-Korol, M.Sc.	R&D Engineer, (0.25)
	phone: 660-7955
Janina Chmielak	Senior Technician
	phone: 660-7479
Dariusz Ćwiek, M.Sc.	Senior Development Enginner
	phone: 660-7577
Maciej Konwicki	Head R&D Engineer
	phone: 660-7233, 253929
Janina Gałęcka	Senior Accountant
	phone: 660-7645
Tomasz Jamrógiewicz, M.Sc.	Senior R&D Engineer-0.5
	phone: 660-7917
Jolanta Krawczyk	Accountant
	phone: 660-7645
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, 255248
Helena Oleksak	Section Manager
	phone: 660-7957, 253769
Tomasz Olszewski, M.Sc.	Senior R&D Engineer-0.5
	phone: 660-7577
Andrzej Owczarek, M.Sc.	Senior Development Engineer
	phone: 660-7793
Małgorzata Pacak	Secretary
	phone: 660-7829, 255248
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
phone: 660-7479
Hanna Szot Accountant

phone: 660-7743
Anna Tratkiewicz Secretary
phone: 660-7233, 253929
Andrzej Wasilewski Worker
phone: 660-7919
Joanna Witkowska Senior Technician
phone: 660-7955, 251363
Stanisław Żmudzin, M.Sc. Senior R&D Engineer -0.5
phone: 660-7635

3. TEACHING ACTIVITIES (academic year 1996/97)

3.1. Basic courses

[Edu1] *Digital Measurement Technique* (Cyfrowa technika pomiarowa - CTP); 3h/week; semester 6; K. Adamowicz.

[Edu2] *Detection of Nuclear and Medical Signals - Lab* (Detekcja sygnałów jądrowych i medycznych - DSJML); 2h/week; semester 7; Z. Pawłowski.

[Edu3] *Detection of Nuclear and Medical Signals* (Detekcja sygnałów biomedycznych i jądrowych - DSJM); 4h/week; semester 6; Z. Pawłowski.

[Edu4] *Electronics III* (Elektronika III - ELKAIII); 4h/week; semester 4; M. Karolczak.

[Edu5] *Electronic Medical Instrumentation* (Elektroniczna aparatura medyczna - EAM); 3h/week; elective; L. Padee.

[Edu6] *Electronic Medical Instrumentation - Lab*. (Elektroniczna aparatura medyczna - EAML); 2h/week; elective; L. Padee.

[Edu7] *Medical Informatics* (Informatyka medyczna - IM); 4h/week; semester 7; P. Błociszewski.

[Edu8] *Numerical Methods (*Metody numeryczne - MNM); 3h/week; semester 3; R. Z. Morawski.

[Edu9] *Methods of Image Recognition* (Metody rozpoznawania obrazów - MRO); 3h/week; semester 7; M. Kazubek.

[Edu10] *Radiology and Nucleonics* (Radiologia z Nukleoniką - NK); 3h/week; semester 5; W. Scharf.

[Edu11] *Orientation 1* (Orientacja 1 - OR1); 1h/week; semester 1; W. Gwarek.

[Edu12] *Orientation 2* (Orientacja 2 - OR2); 1h/week; semester 2; A. Buchowicz, R.Szabatin.

[Edu13] *Orientation 3* (Orientacja 3 - OR3); 1h/week; semester 3; M.Tajchert.

[Edu14] *Orientation 4* (Orientacja 4 - OR4); 1h/week; semester 4; P.Brzeski.

[Edu15] *Orientation 5* (Orientacja 5 - OR5); 1h/week; semester 5; M. Karolczak, P.Brzeski.

[Edu16] *Orientation 5* (Orientacja 5 OR5/IPE); 1h/week; semester 5; J.Wojciechowski.

[Edu17] *Orientation 6* (Orientacja 6 - OR6); M.Karolczak

[Edu18] *Orientation 6* (Orientacja 6 - OR6/IPE); 1h/week; semester 6; J.Wojciechowski.

[Edu19] *Basics of Electroacoustics* (Podstawy elektroakustyki - PEA); 3h/week; semester 6; A. Leszczyński, J. Narkiewicz-Jodko.

[Edu20] *Basics of Medical Science* (Propedeutyka nauk medycznych - PNMED); 3h/week; semester 5; G. Pawlicki.

[Edu21] *Basics of Microwave Technique - Lab.* (Podstawy techniki mikrofalowej - PTML); 2h/week; semester 6; W. Wojtasiak.

[Edu22] *Basics of Computer Technique* (Podstawy techniki komputerowej - PTKO); 4h/week; semester 1; A. Więckowski.

[Edu23] *Basics of Microwave Technique* (Podstawy techniki mikrofalowej - PTM); 3h/week; semester 5; K. Kowalski.

[Edu24] *Basics of High Frequency Technique - Lab.* (Podstawy techniki w.cz. - TWCZ); 2h/week; semester 4; W. Wojtasiak.

[Edu25] *Basics of Television* (Podstawy telewizji - PT); 3h/week; semester 6; Z. Kozłowski.

[Edu26] *Fields and Waves* (Pola i fale - POFA); 3h/week; semester 3; T. Morawski, W. Gwarek.

[Edu27] *Programming* (Programowanie - PROG); 5h/week; semester 2; A. Podgórski.

[Edu28] *Programming 2* (Programowanie 2 - PROG2); 3h/week; semester 5; P. Błociszewski.

[Edu29] *Computer Systems* (Systemy komputerowe - SYKO); 3h/week; semester 4; T.Jamrógiewicz.

[Edu30] *Operating Systems* (Systemy operacyjne - SOP); semester 5; M. Sypniewski.

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

[Edu31a]*Measuring Systems* I (Systemy pomiarowe I-SPOM; 6h/week; semester 5; W. Winiecki.

[Edu31b]*Measuring Systems* II (Systemy pomiarowe II-SPOM; 6h/week; semester 6; W. Winiecki.

[Edu32] *Microprocessor Techniques* (Podstawy techniki mikroprocesorowej - TMIK); 4h/week; semester 5; K. Czerwiński.

[Edu33] Computer Networks (Sieci komputerowe - SKP1); 2h/week; semester 5 J. Marzec

[Edu34] *Microprocessor Techniques - Lab.* (Technika mikroprocesorowa - TMIL); 2h/week; semester 7; T. Krzymień, B. Konarzewski.

[Edu35] *Signals and Systems* (Sygnały i Systemy - SIS/IPE); 4h/week+laboratory; semester 3; J.Wojciechowski.

[Edu36] *Theory of Signals and Modulations* (Teoria sygnałów i modulacji - TSIM); 4h/week; semester 4; T. Kosiło, K. Radecki.

[Edu37] *Digital Circuits - Lab.* (Układy logiczne - UKLO); 2h/week; semester 4; P. Miazga.

3.2   Advanced courses

[Edu38] *Dosimetry and Spectrometric Measurements* (Dozymetria i pomiary spektrometryczne - DPS); 4h/week; semester 8; A. Piątkowski.

[Edu39] *Radioelectronics Laboratory* (Laboratorium radioelektroniki - LR); 4h/week; semester 8; J. Modzelewski.

[Edu40] *Noise Control and Environmental Acoustics* (Akustyka środowiska - AS); 4h/week; elective; E. Kotarbińska.

[Edu41] *Antennas and Radiowave Propagation* (Anteny i propagacja fal - APF); 2h/week; elective; J. Jarkowski.

[Edu42] *Antennas and Radiowave Propagation* (Anteny i propagacja fal - AIPF); 3h/week; elective; J. Jarkowski.

[Edu43] *Ecological and Health Aspects of Electronics* (Aspekty ekologiczne i zdrowotne elektroniki - AZE); 3h/week; elective; T. Buczkowski.

[Edu44] *Digital Measurements - Lab.* (Cyfrowa technika pomiarowa - CTPL); 2h/week; elective; A. Podgórski.

[Edu45] *Digital Image Processing* (Cyfrowe przetwarzanie obrazów - CPOB); 3h/week; elective ; M. Kazubek.

[Edu46] *Programmable Digital Systems* (Cyfrowe układy programowalne - CUP); 5h/week; elective; M. Karolczak, K. Czerwiński.

[Edu47] *Loudspeakers and Loudspeaker Enclosures* (Głośniki i obudowy głośnikowe - GOG); 2h/week; elective; J. Narkiewicz-Jodko.

[Edu48] *Data Compression 2* (Kompresja danych 2 - KODA2); 3h/week; elective; A. Przelaskowski.

[Edu49] *Electroacoustics A - Lab.* (Laboratorium elektroakustyki A - EAAL); 2h/week; elective; J. Narkiewicz-Jodko.

[Edu50] *Electroacoustics B - Lab.* (Laboratorium elektroakustyki B - EABL); 2h/week; elective; A. Leszczyński.

[Edu51] *Methods and Algorithms for Processing Measurement Signals* (Metody i algorytmy przetwarzania sygnałów pomiarowych - MAP); 3h/week; elective; R. Z. Morawski.

[Edu52] *Methods and Equipment for Organ Structure Visualisation* (Metody i urządzenia do wizualizacji struktur narządowych - MWSN); 3h/week; elective; R. Szabatin.

[Edu53] *Metrology and Experimentation Techniques* (Metrologia i technika eksperymentu - MTE); 2h/week; elective; J. Jaworski.

[Edu54] *Acoustic Measurements* (Miernictwo akustyczne - MA); 2h/week; elective; M. Tajchert.

[Edu55] *Radioelectronic Measurements* (Miernictwo radioelektroniczne - MR); 2h/week; elective; A. Fiok.

[Edu56] *Microprocessors and their Applications* (Mikroprocesory i ich zastosowania - MIZ); 3h/week; elective; K. Czerwiński.

[Edu57] *Sound Recording and Forming* (Odbiór i kształtowanie dźwięku - OKD); 2h/week; elective; M. Tajchert.

[Edu58] *Programming of Medical Systems* (Oprogramowanie systemów medycznych OSM); 3h/week;elective; P.Błociszewski.

[Edu59] *Measuring Systems Software* (Oprogramowanie systemów pomiarowych - OSP); 4h/week; elective; W.Winiecki.

[Edu60] *Basics of Radiocommunications* (Podstawy radiokomunikacji - PRR); 2h/week; elective; T. Kosiło.

[Edu61] *Microwave Microstrip Circuit Design* (Projektowanie mikrofalowych układów NLP - NLP); 4h/week; elective; J. Zborowska.

[Edu62] *Basics of Computed Tomography* (Podstawy tomografii komputerowej PTOK); 4h/week; elective; J.Mirkowski.

[Edu63] *Mobile Radio Communication* (Radiokomuni-kacja ruchoma lądowa - RRL); 3h/week; elective; T. Kosiło.

[Edu64] *GSM System* (System telefonii komórkowej GSM - GSM); 2h/week; elective; J. Cichocki.

[Edu65] *System Measuring and Controlling Devices* (Systemowe urządzenia pomiarowe i sterujące - SUPS); 4h/week; elective; K. Adamowicz.

[Edu66] *Artificial Neural Networks in Medicine* (Sztuczne sieci neuronowe w medycynie - SESN2); 3h/week; elective; K. Zaremba.

[Edu67] *Signal Transmitting and Receiving* (Technika nadawania i odbioru - TNO); 2h/week; elective; J. Ebert.

[Edu68] *Cable Television* (Telewizja przewodowa - TVP2); 4h/week; elective; J. Modelski.

[Edu69] *Satellite Television* (Telewizja satelitarna - TVS); 3h/week; elective; J. Modelski.

[Edu70] *NMR Tomography* (Tomografia rezonansu magnetycznego - TRM); 4h/week; elective; A. Piątkowski.

[Edu71] *Digital Signal Transmission* (Transmisja cyfrowa sygnałów - TCS); 5h/week; elective; T. Kosiło.

[Edu72] *Data Transmission in Computer Systems* (Transmisja danych w systemach komputerowych - TDSK); 3h/week; elective; T. Buczkowski.

[Edu73] *Nuclear Medicine Equipment* (Urządzenia medycyny nuklearnej - UMN); 4h/week; elective; W. Scharf.

[Edu74] *Contemporary Applications of Microwaves* (Współczesne zastosowania mikrofal - WZN); 3h/week; elective; J. Modelski.

[Edu75] *Application of DSP in Instrumentation* (Zastosowania procesorów sygnałowych - ZPS); 2h/week; elective; A. Podgórski.

[Edu76] *Analysis of Electromagnetic Fields* (Metody analizy pól elektromagnetycznych - MAPE); 3h/week; Ph.D. studies; T. Morawski, W. Gwarek.

[Edu77] *Radio Networks and Systems* (Sieci i systemy radiowe - SSR); 3h/week; K. Puczko.

[Edu77a] *Graphs and Networks* (Grafy i Sieci - GIS/IPE); 3h/week; J.Wojciechowski.

3.3. Special courses

Abbreviations used in the description of the courses:
SPR - Postgraduate Course on Radiocommunication
RAD - Courses on Radiocommunication, Electro-acoustics and Medical Engineering (RADEM)

[Edu78] *Antennas for Telecommunication Applications* (Anteny radiokomunikacyjne, UHF i mikrofalowe - ARM); 24h; SPR; S. Rosłoniec.

[Edu79] *Digital Signal Transmission* (Cyfrowa transmisja sygnałów - CTS); 28h; SPR; T. Kosiło.

[Edu80] *Digital Signal Processing* (Cyfrowe przetwarzanie sygnałów - CPS); 16h; SPR; K. Kulpa.

[Edu81] *Digital Cellular Systems* (Cyfrowe systemy komórkowe - CSK); 16h; SPR; J. Cichocki, Assist. Prof., Ph.D., J. Kołakowski.

[Edu82] *Computer-Aided Radiomonitoring* (Komputerowe monitorowanie emisji - KME); 4h; SPR; J. Cichocki, J. Kołakowski.

[Edu83] *Computer Controlled Measurement and Data Processing* (Komputerowe sterowanie i przetwarzanie danych - KSP); 37h; SPR; K. Adamowicz, A. Więckowski, W. Winiecki.

[Edu84] *Radio Links and Satellite Communication* (Linie radiowe i łączność satelitarna - LR); 20h; SPR; J. Zygierewicz.

[Edu85] *Microprocessors and Programmable Logic Circuits* (Układy mikroprocesorowe i programowalne - MUP); 12h; SPR; K. Czerwiński, T. Buczkowski.

[Edu86] *Microwave Techniques* (Problemy techniki mikrofalowej - PTMI); 6h; SPR; K. Kowalski.

[Edu87] *Theory of E-M Fields and Microwaves* (Problemy teorii pola i techniki mikrofalowej - PTM); 20; SPR; K. Kowalski.

[Edu88] *Radiowave propagation* (Propagacja fal - PF); 16h; SPR; J. Jarkowski.

[Edu89] *Wide-band Systems in Telecommunication* (Systemy szerokopasmowe w telekomunikacji - SST); 16h; SPR; A. Dąbrowski.

[Edu90] *Microprocessor Engineering* (Technika mikroprocesorowa - TMP); 20h; SPR; K. Czerwiński.

[Edu91] *Modern Radiocommunication and Broadcasting Systems* (Współczesne systemy radiokomunikacyjne i radiofoniczne - WRR); 32h; SPR; T. Kosiło.

[Edu92] *Contemporary Telecommunication Networks* (Współczesne sieci telekomunikacyjne - WST); 20h; SPR; M. Dąbrowski.

[Edu93] *Contemporary Television Systems I* (Współczesne systemy telewizyjne I - STV); 20h; SPR; M. Rusin.

[Edu94] *Contemporary Television Systems II* (Współczesne systemy telewizyjne II - WST); 20h; SPR; J. Modelski.

[Edu95] *Interference in Radio Systems* (Zakłócenia w systemach radiowych - ZR); 16h; SPR; W. Gwarek.

[Edu96] *Course on Internet* (Obsługa sieci Internet); 8h; RAD; J. Marzec.

[Edu97] *Course on Digital Cellular Telephony* (Cyfrowa telefonia komórkowa); 9h; RAD; J. Cichocki.

[Edu97a] *Course on Basis of Digital Cellular Telephony* (Podstawy cyfrowej telefonii komórkowej); 10h; RAD; J. Cichocki.

[Edu97b] *Course on Basis of Digital Cellular Telephony GSM/DCS* (Podstawy systemu telefonii komórkowej GSM/DCS); 8h; RAD; J. Cichocki.

[Edu97c]*Course on System of Cellular Telephony* (System telefonii komórkowej); 24h; RAD; J. Cichocki.

3.4. International co-operation

[Edu98]   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-),
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.

[Edu99]   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.

[Edu100]   TEMPUS   JEP-07403-94:   **„Modern Technologies in Telecommunication for new Polish Educational Systems**
(Nowoczesna technologia telekomunikacyjna w polskim systemie nauczania)
J. Modelski, Prof., D.Sc.,
T. Kosiło, T. Kacprzak, S. Hausman,
1994-1997

The main goals of the project were: curriculum development, staff retraining and updating, intensive courses and student mobilities.

[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.,
K. Zarzycki, A. Davios, R. Nonte
1994 - 1998

The strategic goal of the project is to prepare mouns 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] **Selected Problems of Digital Transmission in Radiolink** (Wybrane zagadnienia transmisji cyfrowej łączem radiowym)
Jacek Jarkowski, Ph.D.
T. Buczkowski, K. Czerwiński, T. Kosiło,
K. Radecki, H. Chaciński, M. Tarka,
A. Olesiak, A. Masny
09.06.96 - 30.03.97

- Applications to radio transmission in systems for disabled and elderly.
- Signal processors for generation of digital modulated signals
- Accuracy investigation in the scintillation counters.

[Pro2] **New Methods for Analysing and Designing TV Circuits, Methods for Measurements** (Nowe matody analizy i projektowania układów telewizyjnych oraz metody ich pomiarów)
Józef Modelski, Prof.,D.Sc.,
J. Kondarewicz, J. Marzyjanek,
T. Smakuszewski, J. Kordalewski,
09.05.96 - 30.03.97

- Analysis of TV equipment with newest devices like PHILIPS SAA7110.
- Investigating more effective methods of TV picture compression.
- Objective and subjective criteria of TV image quality.
- New research places for digital signal processing and remote control of the time-lapsed VCR.

[Pro3] **New Method for Measurement of Parameters of Anisotropic Materials** (Nowa metoda pomiaru parametrów materiałów anizotropowych)
Krzysztof Derzakowski, Ph.D.,
09.05.96-30.03.97

- Elaboration of algorithms and a computer program for analysis of multilayered resonator containing the uniaxial anisotropic materials.
- Elaboration of the measurement method of components of the tensor permittivity for uniaxial anisotropic materials.
- Elaboration of an algorithm and a computer program for determination of material parameters on the base of measured data.
[Pub51], [Pub63]; [Rep5].

[Pro4] **System for Sound Recording and Processing** (System do nagrań i obróbki dźwięku)
Andrzej Leszczyński, D.Sc.,
M. Tajchert, J. Paluchowski, A. Aronowski
9.06.96 - 30.03.97

- Concept of a system for sound recording and processing.

[Pro5] **High-Efficiency Constant-Frequency Supply Circuits with H.F. Energy Conversion** (Wysokosprawne układy zasilające z przetwarzaniem energii w. cz. o stałej częstotliwości)
Jan Ebert, Prof., D.Sc.
M. Mikołajewski, J. Modzelewski, A. Owczarek
9.05.96 - 30.04.97

- Research on novel circuits of high- and constant-frequency resonant converters.
- Elaboration of design procedure for the converters.
- Design of the converter with h.f. synchronous regulator comprising two transistor MOSFET switches.
- Analysis of the circuit operation, optimisation of its parameters.
- Experimental testing of the dc/dc converter with a Class E amplifier .
[Rep6].

[Pro6] **Methods for Analysis and Design of Measuring Systems** (Metody analizy i projektowania systemów pomiarowych)
Roman Z. Morawski, Prof., D.Sc.
K. Adamowicz, R. Leoniak, A. Miękina,
A. Podgórski, P. Sokołowski, W. Winiecki;
9.05.96 - 30.04.97

- Systematic arrangement of source information on methodological, mathematical and algorithmic fundamentals of measurement channel calibration and measurand reconstruction.
- Algorithms for static or quasi-static calibration of measurement channels based on the use of splines and neural networks.
- Algorithms for dynamic reconstruction of measurands based on non-linear digital filters.
- Procedures for spectrogram interpretation, based on the algorithms of mesurand reconstruction.
- Systematic arrangement of source information on integrated software environments dedicated to computer-aided design of measuring systems.
- Systematic arrangement of concepts related to the methodology of virtual instruments design.
[Pub64], [Pub98], [Pub99].

[Pro7] **Methods of Analysis, Modelling and Design of Microwave Passive Circuits, Amplifiers and Generators** (Metody badania, modelowania i projektowania mikrofalowych układów pasywnych, wzmacniających i generujących)
Tadeusz Morawski, Prof., D.Sc.,
W. Gwarek, K. Kowalski, W. Wojtasiak, D. Gryglewski, M. Celuch-Marcysiak, W. Kazubski, M. Lubiejewski
09.05.96 - 30.03.97

- Elaboration of methods of analysis, modelling and design of microwave passive circuits, amplifiers and generators.
- Elaboration of computer programs, design and experimental examination of models of microwave circuits.
- Models of microwave transistor amplifiers, methods of analysis of axisymmetrical antennas, method of description of thermal properties of Gunn diodes.

[Pro8] **Problems and Methods of GSM Radio Equipment Measurements** (Problemy i me-

tody pomiaru urządzeń radiokomunikacyjnych systemu GSM)
Adam Fiok, Prof., D.Sc.,
J Cichocki, J. Kołakowski, S. Żmudzin
9.06.96 - 30.03.97

- Recognition of measurement needs connected to the introduction of GSM system in Poland.
- Analysis of the state of standardisation and availability of instruments intended for GSM radio equipment measurements.
- Determination of requirements for base station measurement systems.

[Pro9] **Radiation Methods in Medical Technique**
(Metody radiacyjne w technikach medycznych)
Zdzisław Pawłowski, Prof., D.Sc.,
A. Piątkowski, M. Kazubek, R. Szabatin,
J. Mirkowski
09.05.96 - 30.03.97

The resesarch works are concentrated on four subjects:
a) Digital radiography:
  - analysis of sensors properties for measurements of bone density,
  - comparative analysis of detective quantum efficiency of digital radiographic sensors.
b) Hardware upgrade for MRI BMT-1000:
  - development of digital receiver for NMR tomography
c) X-ray stereoscopy:
  - development of 3D object interpolation method based on 2D radiograms,
  - development of reconstruction algorithms for stereoradiography.
d) Medical imaging:
  - hardware up grade for SPECT tomography,
  - gammacamera interface work-out.

Projects granted by the Rector

[Pro10] **Very Low Bitrate Image Coding with the use of Multiresolution Analysis** (Kodowanie obrazu video z bardzo dużym stopniem kompresji)
Józef Modelski, Prof., D.Sc.,
G.Siemek
24.05.96 - 31.05.97

- Elaboration of image segmentation algorithm based on the uniformity of motion vectors criteria.
- Elaboration of motion compensation algorithm based on the above mentioned segmentation algorithm.
- Implementation of both algorithms in an image coder.
[Rep10].

Pro11] **Switching Supplies in Collector- (Drain- or Anode-) Amplitude-Modulation Circuits of Radio Transmitters** (Zasilacze impulsowe w układach kolektorowej (drenowej albo anodowej) modulacji amplitudy w nadajnikach radiowych)
Jan Ebert, Prof., D. Sc.,
J. Modzelewski, A. Owczarek
24.05.1996 - 30.09.97

- Research on an improvement of the collector- (or drain- or anode-) circuits of radio transmitters.
- Designing and testing of experimental supply using the integrated circuit SG 1525A.

[Rep7].

Pro12] **Microwave Switched Phase Shifters**
(Mikrofale przełączane przesuwniki fazy)
Taduesz Morawski, Prof., D.Sc.,
J. Zborowska, W. Wojtasiak, M. Sypniewski;,
D. Gryglewski, M. Lubiejewski
24.05.96 - 31.05.97

- Methods of design of phase shifters with PIN diodes.
- Design of chosen types of phase shifters.

[Pro13] **Automated Bone Mineral Measurement Based on the Evaluation of Computerized Radiology and Tomography Images**
(Automatyczne oznaczenie stopnia mineralizacji układu kostnego na podstawie analizy odwzorowań tomograficznych i planarnych rentgenowskich)
Zdzisław Pawłowski, Prof., D.Sc.,
P. Błociszewski, D. Ćwiek
24.05.96 - 31.05.97

- Creation of the algorithm for automatic determination of geometric parameters and for diagnostic coefficients calculation.
- Creation of the clinical program for testing of the implemented method.
- Primary results verification and diagnosis quality estimation in the selected clinical centers.

The aim of the study was to create and to apply the automated bone mineral density (CBMD) measurement algorithm based on the determination of geometric parameters and osteoporosis indices for vertebrae imaging.

Projects granted by the Dean

[Pro14] **The Resonator Antenna Synthesis with Possibilities Given by Application of Analytic Current Distribution** (Synteza anten rezonatorowych z uwzględnieniem możliwości wynikających z zastosowania rozkładów analitycznych)
Jacek Jarkowski, Ph.D.,
15.06.96 - 26.02.97

- Research on analytic electromagnetic field distribution on the emitting surfaces of resonator antennas and possibility of their application for pattern forming.
- Designing of computer program for calculating and optimalisation of the analytic electromagnetic field distributions on the emitting surfaces on resonator antennas.

[Pro15] **The New Method of Analysis of T-wave Alternans** (Nowa metoda badania naprzemienności załamka T sygnału EKG)
Tomasz Buczkowski, Ph.D.,
D. Janusek, P. Janusek
15.06.96 - 23.02.97

- Elimination of the need for external pacing during T-wave analysis.
- Development of specialized software.
- Establishment of stationary laboratory test stand.
- Verification of the new method in time - and frequency - domains.
- Development of a new rate - independent method of T-wave alternans analysis.

- Development of original software for ECG signal acquisition, presentation, and alternans evaluation in Turbo Pascal.

[Pro16] **Testing the Effectivity of Vision Transferal Filter** (Badanie skuteczności działania rekurencyjnego filtru wyzyjnego)
Józef Modelski, Prof., D.Sc.,
J. Kondarewicz, T. Smakuszewski;
15.06.96 - 26.02.97

- Analysis of separation between the noise spectrum and the spectrum of useful vision signal.
- Analysis of possibility of designing transversal filter for noise reduction.
- Laboratory model of adaptive transversal filter and station for subjective testing a effectivity of reduction of noise, and distortions in moving video pictures.

[Rep11].

[Pro17] **Elaboration of a Measurement Method of Thermal Properties of Gunn Diodes** (Opracowanie metody pomiaru właściwości pomiaru termicznych diod Gunna)
Krzysztof Derzakowski, Ph.D.,
J. Modelski, W. Kazubski
20.02.96 - 31.05.97

- Elaboration of the measuring method of basic thermal properties of Gunn diodes.
- Elaboration of methods of obtaining additional information about thermal effects in Gunn diodes.
- Elaboration and testing of a computer program for the above purpose.

The result of the grant is the new measuring method of thermal properties of Gunn diodes as well as the computer program for modelling these properties.

[Pro18] **Application of the Digital Signal Processors in the Selected Instrumentation for Sound Analysis and Measurement** (Zastosowanie procesorów sygnałowych w wybranej aparaturze do pomiaru i analizy dźwięku)
A. Podgórski, Ph.D.,
A. Miękina, R. Z. Morawski;
15.06.96 - 30.06.97

- Broadening of the field of applications of the signal analyser working in the acoustic band (0-25,6 kHz) by the development of new functions: measurement of the reverberation time, measurement of the envelope of the signal (instantaneous amplitude) and measurement of the unbalance of the rotating masses in one and two planes.
- Beginning of works aimed at the development and construction of the four-channel measurement plug-in card to the PC compatible computer (the card will be equipped with 18-bit A/D converters and 66 MHz DSP56002 of Motorola).
- Development of software for the SVAN 910 analyser.

[Pro19] **Application of Computer Networks in Measuring Systems** (Wykorzystanie sieci komputerowych w systemach pomiarowych)
Wiesław Winiecki, Ph.D.,
K. Adamowicz, R. Leoniak, P. Sokołowski;
15.06.96 - 30.06.97

- Analysis of a possibility of measurement experiments using computer networks.
- Overview of measuring systems remote control via Internet.

- Methods of remote controlling viaInternet using LabWindows/CVI (analysis and practical experiments).

[Rep1].

[Pro20] **Power Combining and Intermitting Circuits Design for Microwave Power Amplifiers** (Projektowanie układów sumowania mocy i obwodów międzystopniowych mikrofalowych wzmacniaczy mocy)
Tadeusz Morawski, Prof., D.Sc.,
S. Rosłoniec, J. Zborowska, W. Wojtasiak, M. Sypniewski; J. Zambrzycki, M. Andrzejewski, D. Gryglewski, M. Lubiejewski
15.06.96 - 26.02.97

- Elaboration and testing of power combining and intermaching circuits of microwave power amplifiers.
- Computer method of design the of power combining and intermaching circuits for linear power amplifiers with GaAsMESFET transistors for the L to X - band.
- Experimental verification of proposed CAD method.

[Pro21] **Application of Selected Algoritms of Numerical Integration to Electromagnetic Simulation of Microwave Circuits Incorporating Nonlinear Components** (Zastosowanie wybranych algorytmów całkowania numerycznego do symulacji elektromagnetycznej obwodów mikrofalowych z elementami nieliniowymi)
W. Gwarek, Prof., D.Sc.,
A. Więckowski, M. Sypniewski, M. Celuch-Marcysiak, A. Kozak;
15.06.96 - 30.06.97

- General mathematical framework for deriving of nonlinear electromagnetic simulation algorithms directly from the Maxwell equations.
- Classification of the algorithms into explicit, semi-implicit, and implicit groups (the last one including only the in-house schemes).
- Theoretical investigation of stability criteria and order of accuracy for the three groups, confirmed in numerical experiments.
- Development of a specialized Monotone Admittance method for fast implicit nonlinear integration within the FDTD environment.

[Pro22] **Algorithms for Computer-aided Design of Antenna Arrays** (Algorytmy komputerowego projektowania ścianowych anten radiolokacyjnych)
Stanisław Rosłoniec, Prof., D.Sc.,
Phan Thanh Bang
15.06.96 - 26.02.97

- Computer programs for designing the planar in-phase antenna arrays.
- Developing the program ARRAY - A1 that allows us to analyze regular, planar antenna arrays whose radiating elements can be excited arbitrarily.
- Developing the program ARRAY -S1 that is intended to design the linear in-phase antenna arrays with minimum (in the sense of Chebyshev criterion) level of side lobes.

[Pro23] **Problems of Reliability of Measuring Metasystems** (Problemy niezawodności metasystemów pomiarowych)
Adam Fiok, Prof., D.Sc.,
J Cichocki, J. Kołakowski, S. Żmudzin

- New approach to classification of metasystem failures.
- Research on unreliability of measurement results, and methods for detection and elimination of unreliable results.
- Proposal of strategy for measuring results evaluation.

[Pro24] **Clinical Software for Nuclear Medicine** (Oprogramowanie kliniczne dla potrzeb medycyny nuclearnej)
Piotr Brzeski, Ph.D.,
P. Błociszewski, D. Ćwiek, T. Olszewski, W. Smolik, R. Szabatin
15.06.96 - 26.02.97

- Elaborating, testing and verifying the clinical program for evaluation of left ventricle heart musle perfusion on the basis of data from SPECT (Single Photon Emission Computerized Tomography) studies.
- Clinical verification of the program by using patients' data obtained in Picker and Elscint nuclear madicine systems.

[Pro25] **Wavelet-Based Image Data Compression** (Kompresja danych obrazowych z wykorzystaniem transformat wavelet)
Artur Przelaskowski, Ph.D.,
M. Kazubek, T. Jamrógiewicz,
15.06.96 - 26.02.97

- Realization of wavelet-based compression technique.
- Basic optimization for wavelet transform.
- Elaboration of efficient coefficient quantization and coding scheme.
- Searching for effective filters for multiresolution analysis (literature, conferences).
- Coefficient value distribution analysis for optimization of quantization and coding process.
- Compression efficiency comparison tests for wavelet and cosine transform techniques.

[Pub80], [Pub81], [Pub82], [Pub83], [Pub84].

[Pro26] **Elaboration of WWW System for the Institute of Radioelectronics** (Opracowanie systemu udostępniania informacji o Instytucie Radioelektroniki w sieci Internet za pośrednictwem WWW)
Janusz Marzec, Ph.D.,
15.06.96 - 26.02.97

[Pro27] **Contrast Bolus Tracking Method for Brain Stroke diagnosis** (Metoda wspoma-gająca diagnozowanie wczesnych udarów mózgu za pomocą tomograficznych badań dynamicznych)
Piotr Bogorodzki, M.Sc.,
15.06.96 - 28.02.97

- Developing of novel method for function image evaluation from image set, obtained in sequential CT or MRI scanning after contrast agent injection.
- Application of a correlation technique for analysing the temporal changes in bolus transit dynamics, especially for relative bolus arrive time estimation.

Priority grants

[Pro28] **Enhancement of Ultrasonic Images Using Wavelet Transform** (Zastosowanie transformaty wavelet do polepszania jakości obrazów echokardiograficznych)

Marian Kazubek, Ph.D.,
J. Mirkowski, T. Jamrógiewicz,
A. Przelaskowski,
20.06.96 - 31.05.97

- Analysis of wavelet thresholding as a method for noise removal in 1-D and 2-D, which is potentially useful for medical image denoising.
- Elaboration of basic algorithm that applies wavelet transform on noisy data, then applies thresholding in the wavelet domain, then inverts the transform.
- Elaboration of new method of thresholding and using it to denoising of the different ultrasonic images.
- Comparing results of wavelet denoising with the classical SOI filtering and pseudowiener filtering.
- Application of three methods of denoising: classical SOI filtering, pseudowiener filtering and wavelet space denoising.

[Pro29] **The Algorithms for Tomographics Brain Study Visualisation** (Algorytmy wizualizacji tomograficznych badań mózgu)
Roman Szabatin, Ph.D.,
Błociszewski, P. Brzeski, D. Ćwiek, W. Smolik
20.06.96 - 31.05.97

- Research on new methods for 3D presentation of the tomography images.
- Design the software modules for 3D presentation of tomography images by methods:
  - surface shadow
  - maximum intensity projection
  - volume rendering

[Pro30] **System for Support ofMedical Diagnosis Applying Averaging P-wave High Resolution ECG** (System ekspertowy do wspomagania diagnozy z wykorzystaniem techniki uśredniania załamka P za pomocą wysokorozdzielczej elektrokardiografii)
Ewa Piątkowska-Janko, M.Sc.,
A. Piątkowski, J. Wasielewski, B. Sawionek, P. Bogorodzki, W. Frey
20.06.96 - 31.05.97

- Construction of a specialised program for P-wave averaging signals analysis.
- Recording and processing the data from 174 patients.
- Construction of a decision support system for medical diagnosis applying P-wave averaging signals in HR ECG.
- Clinical validation of decision support system.

[Pro31] **Active and Passive Approach to the Main Fields Shimming** (Metody i techniki polepszania pola głównego w tomografie NMR typu "passive shim" "oraz active shim")
Adam **Piątkowski, Prof., D.Sc.,**
E. Piątkowska-Janko, J. Wasielewski, B. Sawionek, P. Bogorodzki, W. Frey
20.06.96 - 31.05.97

- Simulation of magnetic field in Helmholtz coil.
- Analysis of magnetic field distortion depending of geometrical coil localisation.
- Specification of measurements points in magnetic field area.
- Optimisation of geometrical coil localisation according to measurement.
- Corrections of magnetic field homogeneity in BNT 1000.

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

[Pro32] **Multidimensional Complex Signals, Further Theoretical Developments, Analysis of Possible Applications** (Wielowymiarowe sygnały zespolone, dalszy rozwój teorii oraz zbadanie mozliwości i celowości zastosowań)
Stefan Hahn, Prof., D.Sc.,
J. Jarkowski, A. Buchowicz;
01.07.94 - 30.06.97

- Extension of the well known 1-D analytical signal to the case of 2-D and multidimensional signals.
- Elaboration of the algorithms for the decomposition of the 2-D signal into amplitude and phase components, energy relations.
- Elaboration of the theory of the multidimensional delta distribution and application of the multidimensional complex signal in antenna design.

[Pro33] **Secure Short-range Radio Data Transmission** (Bezpieczna radiowa trans-misja 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.

[Pro34] **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 - 31.03.99

- Development of methodology and techniques of analysis and computer aided design of switched circuits (e.g. power computer).
- Computer implementation and verification of the proposed techniques.
- Research on the following problems:
  - models of components of switched circuits,
  - analysis and simulation of switched circuits using various models (ideal switches versus full models of switches),
  - fast steady state analysis,
  - methodology of design of switched circuits.

[Pro35] **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.,
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.

[Pro36] **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

- 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.

[Pub13], [Pub19], [Pub21], [Pub35], [Pub36], [Pub41], [Pub42], [Pub56], [Pub58], [Pub71], [Pub72].

[Pro37] **Design of Linear Microwave Power Amplifiers** (Projektowanie liniowych mikrofalowych wzmacniaczy dużych mocy)
Morawski Tadeusz, 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.

[Pro38] **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.

[Pro39] **Application of Singular Value Decomposition Method for Automatic Detection of ECG Characteristic Points** (Zastosowanie metod przekształceń przestrzeni wektorowych (OSVD, QSVD) do poprawy wartości diagnostycznej przebiegów elektrokardiograficznych)
Krzysztof Zaremba, M.Sc.,
Pawłowski, J. Marzec, B. Konarzewski, G. Domański
04.09.95 - 31.06.97

- Evaluation of efficiency of the novel method of noise reduction in ECG registration.
- Proposal of new, original method for noise reduction in ECG registration, based on the transformation of the measured data vector space and selective signal filters in the transformed space. This approach allows to obtain a reduction level similar to the results of the classical strong filtration but with much lower diagnostic signal distortion.
- Presentation of two original methods of the ECG internal noise reduction, based on the simultaneous all lead signals processing and involving spatial information concerning the signal and noise sources (OSVD method, QSVD method).

[Pro40] **Methodology and Apparatus for In Vivo Bone Density and Toxic Metal Concentrations in Bones Measurement.** (Metodyka i aparatura do nieinwazyjnych badań gęstości tkanek kostnych i stężeń ciężkich metali toksycznych w kościach)
Zdzisław Pawłowski, Prof., D.Sc.,
J. Marzec, K. Zaremba, B. Konarzewski; G. Domański, A. Sawicki
01.04.95 - 15.12.97

- Development of methods and apparatus for in vivo measurements of bone density and toxic metals concentrations in bones.
- Evaluation of the bone density from the ratio of gamma rays scattered coherently and incoherently in bone. Estimation of toxic metals concentrations on the grounds of a spectrum of a X-ray fluorescence radiation excited in bone.
- Construction of special apparatus to facilitate the measurements. Bone density has been measured by radiophotodensitometry (RD) and coherent to Compton scattering ratio (CCSR) method. Toxic metal concentrations have been determined by X-ray fluorescence analysis.
- Elaboration of mathematical models of used techniques, optimum measuring conditions and statistical and systematic measuring errors.
- Analysis of a possibility of applying the method for diagnosis of osteoporosis and evaluation of toxic metals poisoning and for therapy monitoring in many diseases (oncology, reumatology).

[Pro41] **Multimodal Imaging in Medical Topographic, Tomographic and Functional Studies** (Multi-modalne obrazowanie badań topograficznych, tomograficznych i czynnościowych w medycynie)
Piotr Brzeski, Ph.D.,

M. Kazubek;
01.09.95 - 28.02.97

- Complementary studies of SPECT (PET) images with functional information together with MRI (CT) images with excellent spatial resolution.
- Elaboration of effective algorithms for magnification, rotation and shift of images.
- Elaboration of algorithms and the program for multimodal imaging of topographic and tomographic medical studies.
- Choosing a workstation for multimodal medical image processing and presentation.
- Distribution of the software for multimodal medical image processing and presentation to medical centers.

[Pro42] **The Matched MRI and SPECT Method for Investigation of the Neuro System**. (Skojarzona metoda badania ośrodkowego ukladu 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.

[Pro43] **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 jednoczes-nym.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.

[Pro43a] **Fault Location in Dynamic Systems in the Presence of Noise** (Diagnostyka uszkodzeń w systemach dynamicznych w obecności szumów)
Jacek Wojciechowski, Prof.,D.Sc.,

W. Brygilewicz (IPE/IR)
1.03.97 - 31.12.97

- Method and algorithm of soft fault detection in analog dynamic (linear and nonlinear) electronic circuits.
- Formulation of diagnosis equations with the use of integral sensitivity, and solving by applying Tichonov's functional.
- Developing a method for construction of diagnosis equations based on measurements and simulations, and integral sensitivity.
- Applying a regularization technique for solving over determined diagnosis equations.
- Developing a noise behavioral model of the testing system.

4.3. Other projects

[Pro44] **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)

- Basic concept and system description of the digital broadcasting in the range of frequency 150kHz to 30MHz on the base of world research.
- Posibilities of introducing the system in Poland.

[Pro45] **SRE Transmitter - Reconstruction and Use of the Long-wave Transmitter Located in Radom in the National Electricity Supply Industry** (Nadajnik SRE - wykorzystanie i rozbudowa nadajnika długofalowego w Radomiu dla potrzeb krajowego systemu SRE)
Tomasz Buczkowski, Ph.D.,
K. Czerwiński, T. Kosiło
20.05.97 - 31.07.97
Fund by Margot Engineering, Łochowo (P.H.P.U. Margot Engineering, Łochowo)

- General design of a new radio teleswitching system.
- Feasibility study and schedules for putting system into operation.
- Field trial plan.
- Several realistic versions of the radio teleswitching system that can be realized in the near future.

[Pro46] **Economical Aspects of Introducing GSM at Railways** (Aspekty ekonomiczne wdrożenia GSM na liniach kolejowych)
Józef Modelski, Prof., D.Sc.,
T. Kosiło, K. Radecki, A. Świt,
17.03.97 - 30.04.97
Fund by Central Research Laboratory of Polish Railways (Centrum Naukowo-Techniczne Kolejnictwa PKP)

- Estimation of railways needs concerning radiocommunication.
- Analysis of requirements from railways control and data systems.

- Suggestions concerning system configuration and interfaces.
- Preliminary analysis of 900 MHz band usage.
- Analysis of cooperation between old radio system and GSM-R.

[Pro47] **Study on Introducing the GSM-R System at Railway Stations** (Propozycje wdrożenia systemu GSM-R na stacjach kolejowych)
Józef Modelski, Prof., D.Sc.,
T. Kosiło, K. Radecki, A. Świt,
04.06.97 - 30.11.97
Fund by Central Research Laboratory of Polish Railways (Centrum Naukowo-Techniczne Kolejnictwa PKP)

- Estimation of railway services needs concerning radiocommunication.
- Sugestions concerning system configuration and interfaces
- Sugestions concerning schedule of system introduction and cost estimation.
- Sugestions concerning improvements in present radiocommunication.

[Pro48] **Study on Radio Data Transmission at High Spead Lines** (Możliwości zastosowania radiowej transmisji danych na liniach o dużych prędkościach)
Józef Modelski, Prof., D.Sc.,
T. Kosiło, T. Buczkowski, K. Radecki, W. Kazubski,
23.10.97 - 30.12.97
Fund by Central Research Laboratory of Polish Railways (Centrum Naukowo-Techniczne Kolejnictwa PKP)

- Analysis of railway needs concerning data transmission in 150 MHz networks.
- Sugestions concerning data transmission for train networks.
- Preparing transmission algorithms and analysis of possible realisation.
- Analysis of railways needs concerning data transmission in 900 MHz networks.
- Sugestions concerning system configuration, algorithms and applications.

[Pro49] **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.

[Pro50] **Analysis of Features of Specialised Test Instrumentation for GSM/DCS and IS-95 Mobiles from the viewpoint of Needs of**

National Radiocommunication Agency (PAR) (Analiza właściwości specjalistycznych urządzeń do pomiaru stacji ruchomych standardów GSM/DCS i IS-95 z punktu widzenia potrzeb kontrolno-pomiarowych Państwowej Agencji Radiokomunikacji)
Jacek Cichocki, Ph. D.,
K. Radecki, J. Kołakowski
24.10.97 - 10.12.97
Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR)

- Analysis of features of commercially available instruments for testing of GSM/DCS and IS-95 mobiles.

[Pro51] **Realisation of Measuring Equipment for Mobile Radiomonitoring Stations** (Wykonanie urządzeń pomiarowych do ruchomych stacji radiomonitoringowych)
Stanisław Żmudzin, M.Sc.,
J. Cichocki, J. Kołakowski;
15.05.96 - 31.03.97
Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR)

- Design and development of new computerised switching units.
- Design and manufacture of appropriate PC cards intended for switches and audio recorder control, and microprocessor-based interfaces enabling computer control of antenna rotors.
- Implementation of necessary modifications for commercially available dc/ac converters as well as preparation of detailed specifications for mounting the radiomonitoring.
- Manufacture of unique equipment for several mobile radiomonitoring stations.

[Pro52] **Development of a New Version of Radiomonitoring System Software and the Analysis of Extension of Mobile Radiomonitoring Station Capabilities** (Opracowanie nowej wersji oprogramowania systemu SMS i Analiza dotycząca rozbudowy ruchomych stacji pomiarowych)
Stanisław Żmudzin, M. Sc.,
J. Cichocki, J. Kołakowski
02.09.96 - 20.06.97
Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej ZK PAR)

- Analysis of possibilities for further development of existing radiomonitoring stations (system mobility, extension of a frequency range).
- Application of enhanced software based on *Windows'95* environment.
- Report concerning possibilities for further development of mobile radiomonitoring station (e,g, the choice of antennas, receivers and auxiliary equipment has been discussed).
- Developing a new version of software (it provides new enhanced user interface which makes programming of measuring process easier; program is now a multithread application which assures its more effective execution).

[Pro53] **Development of the GIGATUNE-18 PAR System for Automation of Channel Occupation Monitoring and Signal Parameter Checking with ANRITSU Receiver** (Opracowanie nowej opcji systemu Gigatune-18 PAR przeznaczonej do automatycznego pomiaru poziomu sygnałów stacji radiowych i telewizyjnych z wykorzystaniem odbiornika ANRITSU)
Wiesław Winiecki, Ph.D.,
R. Leoniak;
4.11.96 - 14.02.97
Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej PAR)

- Development of the GIGATUNE -18 PAR system for automation of channel occupation monitoring and signal parameter checking with a capability of storing a large amount of data, using added radiocommunication receiver ANRITSU.
- Design of over 130 different measurement algorithms: from single frequency, frequency range and frequency list algorithms to a complicated list of numerous timer controlled tasks.

[Rep8].

[Pro54] **Instrument Drivers for Radiocommunication Equipment** (Opracowanie sterowników do urządzeń radiokomunikacyjnych)
Wiesław Winiecki, Ph.D.,
P.Bobiński, R. Leoniak;
1.09.97 - 15.12.97
Fund by Military Communication Institute (Wojskowy Instytut Łączności)

- Design of instrument software drivers for system radiocommunication devices with IEC-625 interface: radiocommunication tester and bit error rate meter, using integrated software environment LabView.
- Analysis of a possibility of remote controlling the radiocommunication devices.
- Elaboration of the methodology for application the drivers in a measuring system.

[Rep2].

[Pro55] **Development of the GIGATUNE - 18 PAR / ANRITSU Broadcasting Signal Acquisition System with Additional Devices** (Opracowanie oprogramowania systemu Gigatune-18 PAR / ANRITSU obsługującego zwiększoną liczbę urządzeń).
Wiesław Winiecki, Ph.D.,
R. Leoniak; R.Łukaszewski
1.09.97 - 15.12.97
Fund by National Radiocommunication Agency PAR (Zarząd Krajowy Państwowej Agencji Radiokomunikacyjnej PAR)

- Design of a new version of the GIGATUNE-18 PAR / ANRITSU system for automation of channel occupation monitoring and signal parameter checking in the frequency range 80MHz-1GHz, using added antenna for the range 20÷80MHz and antenna attenuator.
- Designing a software for radiocommunication instruments programming and data acquisition as well as timing of measurements and data storage, using LabWindows/CVI.

• Design of a set of measurement algorithms.
[Rep9]

[Pro56] **Investigation of Technology of Components for Electronic Modulators** (Opracowanie technologii wykonania i wykonanie elementów podzespołów do serii modulatorów elektronicznych)
Kowalski Krzysztof, Ph. D.,
19.05.97- 15.06.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro57] **Computer Testing of 8 AP1 Sets Before Fire Tests** (Przeprowadzenie przy użyciu stanowiska komputerowego autonomicznych badań 8 szt. zespołów AP1, przeznaczonych do prób poligonowych)
Kowalski Krzysztof, Ph. D.,
14.07.97- 25.09.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro58] **Testing and Modernizing of AP1 Sets with Electronic Modulators Before Fire Tests** (Badania, modernizacja , wykonanie oraz przygotowanie do prób poligonowych 4 szt. prototypowych zespołów AP1 z modulatorami elektronicznymi)
Kowalski Krzysztof, Ph. D.,
14.07.97- 22.08.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro59] **Investigation of Durability of AP1 Sets After Long-term Exploitation** (Przeprowadzenie badań trwałości zespołów AP1 po okresie długotrwałej eksploatacji)
Kowalski Krzysztof, Ph. D.,
07.07.97- 15.12.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro60] **Computer Testing of 6 AP1 Sets Before Fire Tests** (Przeprowadzenie przy użyciu stanowiska komputerowego autonomicznych badań 6 szt. zespołów AP1, przeznaczonych do prób poligonowych)
Kowalski Krzysztof, Ph. D.,
03.09.97- 03.10.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro61] **Computer Testing and Improvement of 2 AP1 Sets** (Przeprowadzenie, w oparciu o stanowisko komputerowe badań diagnostyki i usprawnień 2 szt. zespołów AP1)
Kowalski Krzysztof, Ph. D.,
03.09.97- 03.10.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro62] **Computer Testing and Improvement of 6 AP2/AP3 Sets** (Przeprowadzenie w oparciu o stanowisko komputerowe badań diagnostyki i usprawnień 6 szt. zespołów AP2/AP3)
Kowalski Krzysztof, Ph. D.,
03.09.97- 30.11.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro63] **Investigation of Testing Methods and Computer Testing of 4 AP1 Sets** (Opracowanie metodyki badań oraz przeprowadzenie w oparciu o stanowisko komputerowe, badań, diagnostyki i usprawnień 4 szt. zespołów AP1)
Kowalski Krzysztof, Ph. D.,
28.10.97- 30.11.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

[Pro64] **Realization of the Couplers Type S2G2 and S2G4 -8** (Opracowanie i wykonanie płytek sprzęgaczy typu S2G2 i S2G4 - 8)
Wojciech Wojtasiak, M.Sc.,
D. Gryglewski
30.12.96 - 07.11.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

• Technological elaboration of microwave complers with narrow slots.

[Pro65] **Elaboration and Realisation of the Amplifier for the Synthesizer at X - band** (Opracowanie i wykonanie wzmacniacza do syntezera na pasmo X)
Wojciech Wojtasiak, M.Sc.,
T. Morawski, D. Gryglewski
04.11.96 - 24.01.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

• Elaboration of design method of X - band amplifier, manufacturing full amplifier as a part of synthesizer.

[Pro66] **Elaboration and Design of S - band Power Amplifier** (Opracowanie i wykonanie wzmacniacza mocy na pasmo S)
Wojciech Wojtasiak, M.Sc.,
T. Morawski, D. Gryglewski, R. Michnowski, M. Lubiejewski
13.03.97 - 30.05.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

• Elaboration of high-power amplifier for amplification of noise signal at S - band.
• Design, modelling of microwave circuits, measurement of active and passive circuit.
• Elaboration of design procedure and manufacturing full amplifier.

[Pro67] **Elaboration, Realisation and Experimental Invenstigation of the Micro-vawe Noise Source Model for S and C Band** (Opracowanie, wykonanie i badanie modelu

mikrofalowego źródła sygnału szumowego na pasmo S i C)
Wojciech Wojtasiak, M.Sc.,
D. Gryglewski, R. Michnowski
07.10.97 - 15.12.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

- Elaboration of design algorithms of noise source for S and C - band.
- Elaboration of integrated noise source for S and C - band.

[Pro68] **Elaboration and Realisation of the High Power Noise Source** (Opracowanie i wykonanie źródła szumów dużej mocy)
Wojciech Wojtasiak, M.Sc.,
T. Morawski, D. Gryglewski, R. Michnowski, M. Lubiejewski
04.07.97 - 30.09.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

- Design method for high-power noise sources.
- Design, computer simulations, measurements of microwave circuits.
- Elaboration of construction of high-power sources and their practical manufacturing.

[Pro69] **Elaboration and Realization of Doppler Microwave Head** (Opracowanie i wykonanie mikrofalowej głowicy dopplerowskiej)
Wojciech Wojtasiak,
W. Wojtasiak, J. Zborowska, D. Gryglewski; K. Robaczyński, M. Lubiejewski
15.12.97 - 28.12.97
Project developed in cooperation with the Military Technical Institute of Weapons (Wojskowy Instytut Techniczny Uzbrojenia).

- Elaboration of methods of Doppler microwave head design.
- Experimentally examination of designed doppler microwave head.

[Pro70] **COMPASS Experiment - Design of Apparatus and Software Development** (Eksperyment COMPASS - budowa aparatury i przygotowanie oprogramowania)
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.

[Pro71] **Elaboration and Realization of PCMCIA and ISA Interfaces with Drivers for Home Physician Suitcase** (Opracowanie i wykonanie modelu interfejsu PCMCIA oraz interfejsu ISA wraz z drajwerami do walizki lekarza domowego)
Adam Piątkowski,
P. Bogorodzki, E. Piątkowska-Janko
25.03.97 - 15.12.97
Fund by The Institute of Medical Technology and Equipment (Instytut Techniki i Aparatury Medycznej, Zabrze)

- Elaboration of PCMCIA and ISA interfaces.
- Experimental examination of designed interfaces.

5. DEGREES AWARDED

5.1. Ph.D. Degrees

[PhD1] Włodzimierz Brygilewicz: „*Fault Diagnosis of Dynamic Analog systems in the Presence of Noise*", Prof. **J. Wojciechowski** (tutor), Warsaw 1997.

[PhD2] Andrzej Buchowicz: *"Nowy rodzaj filtrów nieliniowych do przetwarzania obrazów barwnych"* (New Class of Non-linear Filters for Colour Image Processing)*,* Prof. **J. Modelski** (tutor), Warsaw 1997 (honours).

[PhD3] Waldemar Smolik: „*Rekonstrukcja obrazu z projekcji metodą największej wiarygodności w tomografii emisyjnej*" (Image Reconstruction from Projections by the Maximum Likelihood Method in Emission Tomography), Prof. **Z. Pawłowski** (tutor), Warsaw 1997

[PhD4] Tahar Habib: „*Nowe, elektronicznie przełączane mikrofalowe filtry kierunkowe*" (Novel Electronically Switchable Microwave Directional Filters), Prof. **S. Rosłoniec** (tutor), Warsaw, 1997

5.2. M.Sc. Degrees

[MSc1] Jarosław Borkułak: „*Automatyczne wykrywanie punktów charakterystycznych sygnału EKG*" (Automatic Detection of ECG Characteristic Points), Assist. Prof. **J. Marzec** (tutor), (5)

[MSc2] Artur Bracki: „*Metodyka projektowania przyrządów wirtualnych z wykorzystaniem zintegrowanych środowisk programowych*" (Methodology for Virtual Instruments Designing Using Software Integrated Environments), Assist. Prof. **W. Winiecki** (tutor), (5)

[MSc3] Krzysztof Dąbrowski: „*Klasyfikacja sygnałów EKG za pomocą sieci neuronowych*" (ECG Signals Classification Using Neural Networks), Assist. Prof. **K. Zaremba** (tutor), (4)

[MSc4] Andrzej Drozd: „*Metody stereowizji rentgenowskiej w zastosowaniu do prześwietleń kości*" (X-Ray Stereoscopy Methods in Bones Imaging), Assist. Prof. **M. Kazubek** (tutor), (4)

[MSc5] Krzysztof Gajewski: „*Oprogramowanie wspomagające interpretację danych w radiolizie impulsowej*" (Software for Computer-Aided Interpretation of Pulse Radiolysys Data), Assist. Prof. **J. Mirkowski** (tutor), (5)

[MSc6] Grzegorz Galiński: „*Algorytmy wyznaczania wektorów ruchu w sekwencji obrazów*" (Algorithms for Motion Vectors Estimation), Assist. Prof. **A. Buchowicz** (tutor), (5)

[MSc7] Adam Grabarski: „*Układ do aktywnej redukcji hałasu w falowodzie ze ścieżką błędu modelowaną szumem*" (A System for Active Noise Control in a Duct with a Noise-Modelled Error Path), Assist. Prof. **J. Narkiewicz-Jodko** (tutor), (5)

[MSc8] Piotr Grzybowski: „*Model układu do oceny sygnału wyjściowego odbiorników radiowych*" (Model of Test Setup for Receiver Output Signal Evaluation), Prof. **A**. **Fiok** / Assist. **J. Kołakowski** (tutors), (5)

[MSc9] Marek Jacewicz: „*Metody identyfikacji cząstek w eksperymencie WASA w Uppsali*" (Methods of Particle Identification in the WASA Experiment in Uppsala), Assist. Prof. **K. Zaremba** (tutor), (5)

[MSc10] Piotr Jakubiuk: „*Interfejs do kamery termowizyjnej*" (Infra-Red Camera Interface), Assist. Prof. **R. Szabatin** (tutor), (5)

[MSc11] Dariusz Janusek: „*Rejestracja i wykrywanie naprzemienności załamka T w niesymulowanych elektrokardiogramach*" (Rate - Independent Method of T-wave Alternans Analysis), Assist. Prof. **T. Buczkowski** (tutor), (5)

[MSc12] Piotr Janusek: „*Rejestracja i wykrywanie naprzemienności załamka T w niesymulowanych elektrokardiogramach*" (Rate - Independent Method of T-wave Alternans Analysis), Assist. Prof. T. **Buczkowski** (tutor), (5)

[MSc13] Hubert Jańczak: „*Zastosowanie metody operatora sprzężonego i parabolicznych funkcji sklejanych typu B do odtwarzania mezurandów*" (Application of the Adjoint-Operator Method and Parabolic B-splines for Mesurand Reconstruction), Prof. **R. Z. Morawski** (tutor), (4)

[MSc14] Jerzy Marek Jegier: „*Zastosowanie pakietu Matlab do wizualizacji rozkładów pól w strukturach z rezonatorami dielektrycznymi*" (Application of the Matlab System for Visualisation of Electromagnetic Field Distribution in Structures Containing Dielectric Resonators), Assist. Prof. **K**. **Derzakowski** (tutor), (5)

[MSc15] Andrzej Jeleń: „*Oprogramowanie stanowiska do radiolizy impulsowej*" (Software for Measuring Stand of Pulse Radiolisys), Assist. Prof. **J**. **Mirkowski** (tutor), (5)

[MSc16] Elżbieta Jeleń: „*Oprogramowanie systemu pomiarowego spektrometru GIBS*" (Software for Measuring System GIPS), Assist. Prof. **J. Mirkowski** (tutor), (5)

[MSc17] Tomasz Kaczorek: *Właściwości pola dźwiękowego w studio nagrań w otoczeniu ekranu dźwiękochłonnego - izolacyjnego* (Properties of a Sound Field in the Recording Studio in the Vicinity of a Sound-barrier), Assist. Prof. **E Kotarbińska** (tutor), (5)

[MSc18] Adam Kądziela: „*Układ do badania zakłóceń w kanałach sąsiednich podczas załączania i wyłączania nadajnika*" (Test Setup for

Investigation of Adjacent Channel Interference Caused by Switching the Transmitter), prof. **A. Fiok** / Assist. **J. Kołakowski** (tutors), (5)

[MSc19] Grzegorz Kluczewski: *„Programowane źródło sygnałów w laboratoryjnym zestawie pomiarowym"* (Programmable Signal Source for Laboratory Measuring System), Assist. Prof. **K. Adamowicz** (tutor), (5)

[MSc20] Jarosław Kordalewski: *„Interfejs zdalnego sterowania do magnetowidu studyjnego"* (Interface for Remote Controlling of Studio Video Tape Recorder), Prof. **J. Modelski** / Assist. **J. Kondarewicz** (tutors), (5)

[MSc21] Krzysztof Kubiak: *„Analiza i badania komory bezechowej"* (Analysis and Acoustic Investigations of an Anechoic Chamber), Assist. Prof. A. Leszczyński / Assist. **J. Paluchowski** (tutors), (5)

[MSc22] Krzysztof Kucharski: *Model systemu do bezprzewodowej akwizycji danych z kilku urządzeń pomiarowych za pomocą podczerwieni"* (Prototype Wireless Data Acquisition System Using Infrared Link Connecting Several Measuring Instruments), Assist. Prof. **T. Buczkowski** (tutor), (5)

[MSc23] Piotr Kuczmarski: *„Uniwersalny modułowy rejestrator dyskowy"* (Modular Disc Recorder), Assist. Prof. A. **Więckowski** (tutor), (4)

[MSc24] Jakub Kupniewski: *„Koder systemu identyfikacji programów telewizyjnych VPS sterowany komputerem PC"* (Video Programme System Encoder Controlled by Personal Computer), Assist. Prof. Z. **Kozłowski** (tutor), (5)

[MSc25] Piotr Lipski: *„System wspomagania analizy i akwizycji preparatów mikroskopowych mózgów zwierzęcych"* (Computer System to Support Acquisition and Processing of Animal Brain Microscopic Speciments) Assist. Prof. **P. Brzeski** (tutor), (4)

[MSc26] Robert Łukaszewski: *„System w standardzie IEEE-488 do pomiarów akustycznych"* (IEEE-488 Measurement System for Acoustic Measurements), Assist. Prof. **W. Winiecki** (tutor), (5)

[MSc27] Piotr Markowicz: *„Mikroprocesorowy woltomierz próbkujący w laboratoryjnym zestawie próbkującym"* (Microprocessor Sampling Voltmeter for Laboratory Measuring System), Assist. Prof. **K. Adamowicz** (tutor), (4)

[MSc28] Ryszard Michnowski: *„Wzmacniacz niskoszumowy do toru odbiorczego radiolokacyjnego modułu nadawczo - odbiorczego z fazową anteną"* (Low-noise Amplifier for Radiolocation Receiver of T/R Module), Prof. **T. Morawski** / Assist. W. **Wojtasiak** (tutors), (5)

[MSc29] Leszek Morzyński: *„Stanowisko laboratoryjne do pomiarów aktywnej redukcji dźwięku w falowodzie akustycznym"* (A Laboratory Stand for Measurement of Active Control of Sound in

a Duct), Assist. Prof. **J. Narkiewicz-Jodko** (tutor), (5)

[MSc30] Jarosław Niewczas: *„Electromagnetic simulations of Antennas Using the FD-TD Method"* (Symulacja elektromagnetyczna anten z wykorzystaniem metody FD-TD), prof. **W. Gwarek** (tutor), (5)

[MSc31] Anita Obrycka: *Analiza metod i urządzeń do pomiaru gęstości tkanek kostnych"* (Analysis of Methods and of Equipment for Bone Density Measurements), prof. **Z. Pawłowski** (tutor), (5)

[MSc32] Zenon Obrycki: *„Program kliniczny do analizy przepływu krwi w mózgu w badaniach SPECT"* (Clinical Program for Blood Flow in Brain Analysis in SPECT Studies), Assist. Prof. **P. Brzeski** (tutor), (5)

[MSc33] Jarosław Ognik: *„Przełącznik mikrofalowy dużej mocy na pasmo C"* (The High-Power C band Microwave Switch), Prof. **S. Rosłoniec** (tutor), (4)

[MSc34] Adam Osytek: *„Zintegrowane środowisko symulatora-analizatora magistrali interfejsu IEC - 625.2 pracujące w systemie MS Windows 95"* (Analyser/Simulator of IEC-625.2/SCPI Measuring System), Assist. Prof. **W. Winiecki** (tutor), (5)

[MSc35] Andrzej Packiewicz: *„Projektowanie mikrofalowych transmisyjnych przesuwników fazy z liniami niejednorodnymi"* (Design of Microwave Transmission Phase Shifters with Nonuniform Lines), Prof. **T. Morawski** / Assist. **W. Wojtasiak** (tutors), (5)

[MSc36] Sławomir Pawliszak: *„Optymalizacja szybkości transmisji danych w sieci komputerowej"* (Optimisation of Data Transfer in Network), Assist. Prof. **A. Więckowski** (tutor), (4)

[MSc37] Artur Piątek: *"Stanowisko laboratoryjne do pomiaru i modelowania elementów biernych w.cz."* (Laboratory Setup for HF Passive Element Measurement and Modelling), Assist. Prof. **J. Cichocki** (tutor), (5)

[MSc38] Dariusz Puto: *„Badania zrozumiałości mowy w nausznikach przeciwhałasowych"* (The Investigation of Speech Intelligibility in Hearing Protectors), Assist. Prof. **E. Kotarbińska** (tutor), (5)

[MSc39] Janusz Sutkowski: *„Badanie możliwości zastosowania ultradźwiękowego miernika odległości do pomiarów geodezyjnych oraz w charakterze pomocy dla osób niepełnosprawnych"* (Research on the Possibility of Application of Ultrasonic Distance Meter for Geodesy Measurements), Assist. Prof. **K. Czerwiński** (tutor), (5)

[MSc40] Ryszard Sypniewski: *„Metoda i urządzenie do bramkowania tomografu NMR sygnałem oddechowym"* (Method and Equipment for NMR Tomograph Triggering by Breath Signals), Prof. **A. Piątkowski** (tutor), (5)

[MSc41] Tomasz Tomaszuk: *„Biblioteka funkcji graficznych wyższego poziomu dla trójwymiarowego edytora graficznego symulatora mikrofalowego QUICK WAVE"* (High-level Graphical Functions Library for 3-D Electromagnetic Simulator), Assist. Prof. **A. Więckowski** (tutor), (5)

[MSc42] Andrzej Wajs: *„Rezonansowa przetwornica napięcia stałego z regulatorem synchronicznym"* (A Resonant DC/DC Converter with a Synchronous Regulator), Assist. Prof. **M. Mikołajewski** (tutor), (5)

[MSc43] Mariusz Warzywoda: *„Układ wyświetlania daty i czasu w obrazie TV - część analogowa układu"* (The Device for Displaying Data and Time in TV Picture (analog part of the device), Assist. Prof. **Z**. **Kozłowski** (tutor), (5)

[MSc44] Jacek Wasilewski: *„Badania urządzeń cyfrowego wywołania selektywnego (DSC)"* (Measurement of Digital Selective Calling (DSC) Equipment), Assist. Prof. **J**. **Cichocki** (tutor), (5)

[MSc45] Sławomir Wronka: *„Metody identyfikacji cząstek w eksperymencie WASA w Uppsali"* (Methods of Particle Identification in the WASA Experiment in Uppsala) Assist. Prof. **K. Zaremba** (tutor), (5)

[MSc46] Wiesław Zawada: *„Ocena skuteczności działania ochronników słuchu dla hałasu impulsowego"* (The Evaluation of Hearing Protectors Performance in Impulse Noise), Assist. Prof. **E. Kotarbińska** (tutor), (4)

6. PUBLICATIONS

6.1. Scientific and technical books

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[Pub96] M. Sypniewski, T. Morawski, M. Kukier: „Reflektometry wielowrotowe - statyczne porównanie metod kalibracji" (Multiport of Calibration Methods Comparison of Calibration Methods), *Mat. XX Seminarium Podstaw Elektroniki i Teorii Obwodów (Ustroń, May 21-24, 1997),* Vol.II, pp.329-332.

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[Pub98] W. Winiecki: „Projektowanie przyrządów wirtualnych z wykorzystaniem zintegrowanych środowisk programowych" (Virtual Instruments Designing Using Integrated Software Environments), *Mat. III Krajowej Szkoły-Konferencji „Metrologia Wspomagana Komputerowo" MWK'97 (Zegrze, May 19-22, 1997),* WSOWŁ, Zegrze 1997, vol. I, pp. 91-136.

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[Pub102] J. Wojciechowski, B. Sawionek, J. Vlach: „A Method for Numerical-symbolic Analysis of Switched Circuits", *Proc. Polish Natl. Conf. Circuits and Systems (Kołobrzeg, October 21-23, 1997),* pp.91-96.

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[Pub104] W. Wojtasiak, D. Gryglewski, S. Zygadło, A. Rutkowski: „Nadajnik na pasmo L z modulacją AM" (Transmitter with AM Modulation for L Band), Mat. *VIII Konferencji Naukowej „Sterowanie i Regulacja w Radiolokacji i Obiektach Latających (Jelenia Góra, June 2-4, 1997),* Vol.II, pp.145-151.

[Pub105] W. Wojtasiak, D. Gryglewski, S. Zygadło, A. Rutkowski: „Heterodyna stacji radiolokacyjnych na pasmo X" (The Synthesizer for Radar for X Band), *Mat. VIII Konferencji Naukowej „Sterowanie i Regulacja w Radiolokacji i Obiektach Latających (Jelenia Góra, June 2-4, 1997),* Vol.II, pp.153-162.

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6.4. Textbooks

[Pub110] J. Krupka, R. Z. Morawski, L. J. Opalski: *Metody numeryczne dla studentów elektroniki i technik informacyjnych* (Numerical Methods for Students of Electronics and Information Technology)*.* Oficyna Wydawnicza PW, Warsaw 1997, 163 pages.

6.5. Other publications

[Pub111] Z. Kulka, M. Nadachowski: translation of the publication R. van de Plassche: *„Integrated Analog-to-Digital and Digital-to-Analog Converters,* Kluwer Academic Publishers (1994), Wydawnictwa Komunikacji i Łączności, 1997.

7. REPORTS

7.1. Research reports

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[Rep2]   P. Bobiński,   R. Leoniak,   W. Winiecki: „Opracowanie sterowników do urządzeń radiokomunikacyjnych" (Instrument Drivers for Radiocommunication Equipment), Technical Documentation, Institute of Radioelectronics, WUT, Warsaw, July 1997, 12 pp.

[Rep3]   T. Buczkowski,   K. Czerwiński,   T. Kosiło: *„Sterowanie częstotliwością radiową w ener- getyce"* (Radio Energy Management), Institute of Radioelectronics, WUT, Warsaw, 1997, 50 pp.

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[Rep5]   K. Derzakowski: *"Nowa metoda pomiaru parametrów materiałów anizotropowych"* (The New Method for Measurements of Parameters of the Anisotropic Materials), Institute of Radioelectronics, WUT, Warsaw, March 1997, 55 pp.

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[Rep7]   J. Ebert,   J. Modzelewski,   A. Owczarek: "Zasilacze impulsowe w układach kolektorowej (drenowej albo anodowej) modulacji amplitudy w nadajnikach radiowych" (Switching Supplies in Collector (Drain- or Anode-) Amplitude- Modulation Circuits of Radio Transmitters), Institute of Radioelektronics, WUT, Warsaw, September 1997, 35 pp.

[Rep8]   R. Leoniak, W. Winiecki: *„Opracowanie nowej opcji systemu Gigatune-18 PAR przeznaczonej do automatycznego pomiaru poziomu sygnałów stacji radiowych i telewizyjnych z wykorzystaniem odbiornika ANRITSU"* (Development of the GIGATUNE-18 PAR System for Automation of Channel Occupation Monitoring and Signal Parameter Checking with ANRITSU Receiver), Institute of Radioelectronics, WUT, Warsaw, February 1997, 23 pp.

[Rep9]   R. Leoniak, W. Winiecki: *„Opracowanie opro- gramowania systemu GIGATUNE-18*

PAR/ANRITSU obsługującego zwiększoną liczbę urządzeń" (Development of the GIGATUNE -18 PAR / ANRITSU Broadcasting Signal Acquisition System with Additional Devices), Institute of Radioelectronics, WUT, Warsaw, December 1997, 23 pp.

[Rep10]   J. Modelski,   G. Siemek: *"Kodowanie obrazu video z bardzo dużym stopniem kompresji z zastosowaniem analizy wielorozdzielczej"* (Very Low Bitrate Image Coding with the Use of Multiresolution Analysis), Institute of Radioelectronics, WUT, Warsaw, May 1997, 14 pp.

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[Rep14]   A. Piątkowski,   P. Bogorodzki: *„Badania nowych środków kontrastowych w niskich polach do badania nad mózgiem i do badań angiograficznych"* (A New Contrast Agent Study for Brain and Vesell Imaging Purpose) Priority Program „Bioengineering", Institute of Radioelectronics, WUT, Warsaw, 1997, 10 pp.

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[Rep18]   W. Wojtasiak,   D. Gryglewski,   T. Morawski: *„Wzmacniacz mocy na pasmo L"* (L - band Power Amplifier), Institute of Radioelectronics, WUT, Warsaw, 1997, 10 pp.

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[Rep20] W. Wojtasiak, D. Gryglewski: *„Syntetyzer na pasmo X"* (X Band Synthesizer), Institute of Radioelectronics, WUT, Warsaw, February 1997, 27 pp.

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8. HOME PATENTS

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9. CONFERENCES, SEMINARS AND MEETINGS

9.1. International conferences

[Con1]   *47. Deutscher Hochschulverbandstag (Dresden, Germany, March 12-15, 1997),* R. Z. Morawski (participant).

[Con2]   *MIOP'97 Conference* (Stuttgart/Sindelfingen, April 22-24, 1997), S. Rosłoniec (speaker).

[Con3]   *IEEE Instrum. & Meas. Technol. Conference - IMTC'97 (Ottawa, Canada, May 19-21, 1997),* R. Z. Morawski (speaker).

[Con4]   *International Conference on Antenna Theory and Techniques (Kiev, Ukraine, May 20-24, 1997),* J. Modelski, (speaker).

[Con5]   *4th European Conference on Engineering and Medicine, „Bridging East and West" (Warszawa, May 25-28, 1997),* K. Zaremba (speaker).

[Con6]   *XIV the IMEKO World Congress „New Measurements - Challenges and Visions" (Tampere, June 1-6, 1997),),* W. Winiecki (speaker, session chairman, member of IMEKO General Meeting).

[Con7]   *IEEE MTT-S International Microwave Symposium (Denver, USA, June 8-13, 1997),* J. Modelski, (chairman of the session, participant in TPC and AdCom meetings), W. Gwarek, (participant of IEEE Chapter Chairmen meeting).

[Con8]   *ASEE Annual Conference (Milwaukee, USA, June 14-19, 1997),* R. Z. Morawski (speaker).

[Con9]   *The III International Conference and Exhibition for Telecommunications and Networking Technologies COMNET'97 (Warsaw, June 18-20, 1997),* K. Adamowicz (speaker).

[Con10]   *15th IMACS World Congress on Scientific Computation, Modelling and Applied Mathematics (Berlin, August 25-28, 1997),* P. Miazga (speaker).

[Con11]   *TFTS'97 - 2nd IEEE UK Symposium on Applications of Time-Frequency and Time-Scale Methods* (Coventry, August 27-29, 1997), A. Przelaskowski (speaker).

[Con12]   *European Conference on Circuits Theory And Design (Budapest, September 1-3, 1997),* J. Wojciechowski (speaker)

[Con13]   *27th European Microwave Conference (Jerusalem, Israel, September 8-13, 1997),* J. Modelski, (chairman of two sessions, participant in EuMC Management Committee and TPC meetings), M. Celuch-Marcysiak, (speaker), W. Gwarek, (session chairman, participant of TPC meeting).

[Con14]   *RF Design'97 Conference Proceedings* (Santa Clara, California, September 10-12, 1997), P. Miazga, S. Rosłoniec (speakers).

[Con15]   *World Congress on Medical Physics and Biomedical Engineering* (Nicea, September 14-19, 1997), W. Smolik (speaker).

[Con16]   *International Conference on Electromagnetics for Advanced Applications - ICEAA (Torino, Italy, September 15-18, 1997),* K. Derzakowski, (speaker).

[Con17]   *Conf. „Direct and Inverse Problems of Electromagnetic and Acoustic Wave" (Lviv, September 15-17, 1997),* J. Gawryszewski (participant).

[Con18]   *AFPAC'97 International Workshop* (Kiel, Germany, September 8-9, 1997), K. Ignasiak (speaker).

[Con19]   *CAIP'97 7th International Conference,* (Kiel, Germany, September 10-12, 1997), K. Ignasiak (speaker).

[Con20]   *The 9th Conference on Microwave Techniques COMITE'97* (Pardubice, October 16-17, 1997), D. Gryglewski, R. Michnowski (speakers).

[Con21]   *SPIE, Multimedia Storage and Archiving Systems II* (Dallas, November 3-4, 1997), A. Przelaskowski (speaker).

9.2. Local conferences

[Con22]   *III Krajowa Szkoła-Konferencja Konferencja „Metrologia Wspomagana Komputerowo (III National School-Conference „Computer Aided Metrology"), (Warszawa-Zegrze, May 19-22, 1997),* W. Winiecki (member of the Scientific Commitee, session chairman, lecturer).

[Con23]   *Krajowa Konferencja Radiokomunikacji Ruchomej KKRR'97 (Mobile Radiocommunication Conference), (Poznań, May 26-28, 1997),* J. Cichocki (speaker).

[Con24]   *VII Konferencja Naukowa „Sterowanie i Regulacja w Radiolokacji i Obiektach Latających" (Control and Adjustment in Radiolocation and Flying Objects), (Jelenia Góra, June 2-4, 1997),* D. Gryglewski (speaker).

[Con25]   *XXIX Międzyuczelniana Konferencja Metrologów MKM'97 (XXIXth Inter-University Metrologists' Conference), (Nałęczów, September 10-12, 1997),* W. Winiecki (speaker, session chairman, member of the Scientific Committee).

[Con26]   *Krajowe Sympozjum Telekomunikacji KST'97, (National Symposium on Telecommunication), (Bydgoszcz, September 10-12, 1997),* K. Czerwiński, D. Gryglewski, R. Michnowski (speakers)

[Con27]   *Algorytmy Ewolucyjne i Optymalizacja Globalna (Evolutionary Algorithms and Global Optymisation), (Rytro, September 15-19.1997),*

J. Wojciechowski (member of the Scientific Committee, session charman, speaker).

[Con28] *Konferencja „Akustyka Studiów i Reżyserii Radiowych" (Acoustic for Radio Studios and Control Rooms Conference), (Wrocław, September 21-22, 1997),* M. Tajchert (participant).

[Con29] *Konferencja „Reżyseria i Inżynieria Dźwięku" (Sound Engineering Conference), (Kraków, September 26-27, 1997),* M. Tajchert (participant).

[Con30] *Konferencja „Kontrola Jakości Aparatury Rentgenowskiej Pod Kątem Zmniejszenia Narażenia Pacjentów" (Roentgen Equipment Quality Control), (Kutno, September 1997),* J. Marzec (speaker).

[Con31] *III Sympozjum Naukowe "Techniki Przetwarzania Obrazu", (III Scientific Symposium "Image Processing Techniques"), (Serock, October 9-12, 1997),* A. Buchowicz, (speaker), Wł. Skarbek (chairman of the session, speaker), K. Zaremba (participans).

[Con32] *V Sympozjum Klubu Polskie Forum ISO 9000 „Metrologia w Systemach Jakości -2" (V Symposium of Polish Forum ISO 9000 Club „Metrology in Quality Systems -2"), (Mikołajki, October 20-22, 1997),* W. Winiecki (speaker).

[Con33] *III Konferencja Naukowo-Techniczna MECHATRONIKA'97 (Mechatronics'97), (Warsaw, November 20-22, 1997),* C.Niedziński, P. Sprzęczak (speakers).

[Con34] *XX Krajowa Konferencja Teorii Obwodów i Układów Elektronicznych (XX Natl. Conf. on Circuit Theory And Elektronic Circuits), (Kołobrzeg, October 21-23, 1997),* J. Wojciechowski (member of the Scientific Committee, speaker), M. Mikołajewski, J. Modzelewski (speakers).

[Con35] *X Krajowa Konferencja Naukowa „Biocybernetyka i Inżynieria Biomedyczna" (Biocybernetics and Biomedical Engineering Conf.), (Warsaw, December 4-6, 1997),* K. Zaremba (speaker).

9.3. Schools, seminars and meetings

[Con36] *Seminarium naukowe Komisji Kształcenia Komitetu Metrologii i Aparatury Naukowej PAN (Scientific Meeting of the Measurement Theory Section and the Education Section of the Metrology and Instrumentation Committee, Polish Academy of Sciences), (DPT "Ustronie", January 6-8, 1997),* W. Winiecki (speaker).

[Con37] *Technical Program Committee Meeting of the 1997 IEEE MTT-S International Microwave Symposium (Denver, USA, January 10-12, 1997),* J. Modelski (participant).

[Con38] *Seminarium „Nowoczesne metody pomiarowe w telekomunikacji" (Seminar „New Measuring Methods in Telecommunication"), Centrum Promocji i Szkolenia Teleinformatyki (Warszawa-Miedzeszyn, January 27-28, 1997),* W. Winiecki (speaker).

[Con39] *Seminarium programu priorytetowego "Bioinżynieria" (WUT Seminar of priority program „Bioengineering"), (WUT, Warsaw, March 1997),* Z. Pawłowski, R. Szabatin, E. Piątkowska-Janko, P. Bogorodzki (speakers); P. Brzeski, A. Piątkowski, J. Marzec, B. Konarzewski, K. Zaremba (participants).

[Con40] *Seminarium programu priorytetowego "PATIA" (WUT Seminar of priority program „PATIA"), (WUT, Warsaw, March 1997),* J. Narkiewicz-Jodko (speaker)

[Con41] *8th Meeting of the European Standards Committee (8 Posiedzenie Europejskiego Komitetu Normalizacyjnego CEN/TC 159 „Ochronniki słuchu"),* British Standards Institution *(London, April 11-12, 1997),* E. Kotarbińska, expert - representative of PKN, Normalizacyjna Komisja Problemowa nr 21 ds. Środków Ochrony Indywidualnej Pracowników (Polish Committee of Normalization, Sub-Committee No. 21, Means for Indyvidual Protection of Employers).

[Con42] *Seminar „Science - Education - Technology" (Pittsburgh, USA, May 15-18, 1997),* R. Z. Morawski (speaker).

[Con43] *XX Seminarium Podstaw Elektroniki i Teorii Obwodów (XX Seminar on Electronics Basis and Circuit Theory), (Ustroń, May 21-24, 1997),* M. Kukier (speaker).

[Con44] *HP Seminar „Changes in US Engineering Education" (Loveland, USA, May 25-28, 1997),* W. Winiecki (participant).

[Con45] *Seminarium Polskiego Towarzystwa Medycyny Nuklearnej „Komputery w medycynie" (Computers in Medicine), (Katowice-Ligota, June 1997),* R. Szabatin (speaker).

[Con46] *TEMPUS JEP 7403 Meeting (Lisboa, Portugal, July 3-6, 1997),* J. Modelski, (speaker).

[Con47] *XLIV Otwarte Seminarium z Akustyki (XliV Open Seminar on Acoustics), (Gdańsk - Jastrzębia Góra, September 15-18, 1997),* Polskie Towarzystwo Akustyczne, Oddział Gdańsk, E. Kotarbińska (speaker), J. Narkiewicz-Jodko (speaker).

[Con48] *The 103rd Convention of the Audio Engineering Society* (New York, September 26-29, 1997), J. Paluchowski (participant).

10. STATISTICAL DATA

SPECIFICATION	1996	1997	DIFFERENCE
academic staff total	77,5	85,5	+8
full professors	4	4	0
professors	5	7	+2
associate professors	0	0	0
assistant professors	31,5	32,5	+1
senior lecturers	2	4	+2
lecturers	2,5	3	+0,5
assistants	10,5	9	-1,5
Ph.D. students	22	26	+4
technical staff	20,5	15,25	-5,25
administrative staff	7	8	+1
other staff	2	2	0
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	125	164	+39
workstations	4	4	0
personal computers (PC 486 and better)	121	160	+39
library resources			
books (number of volumes)	12 239	12657	18
books (number of titles)	7 071	?????	???
journals (number of titles subscribed to)	256	?????	???
teaching activities			
basic courses	39	36	-3
advanced courses	44	39	-5
other courses	24	20	-4
international projects	2	4	+2
research projects total	54	63	+9
granted by the University	26	23	-3
granted by the State institutions	12	12	0
other projects	16	28	+12
degrees awarded			
Ph.D. degrees	2	4	+2
M.Sc. degrees	40	46	+6
publications total	109	111	+2
sci.-tech. Books	3	7	+4
sci.-tech. papers in journals	23	24	-1
sci.-tech. papers in conference proceedings	68	66	-2
teaching aids	2	2	0
other publications	13	13	0
research reports	20	21	+1
patents			
patents granted	2	1	-1
patent application	1	0	-1
conferences			
number of conferences attended by the staff	32	35	+3
number of participants from the Institute	76	77	+1