



INSTITUTE
OF MICROELECTRONICS
AND OPTOELECTRONICS



ANNUAL REPORT
2003

Edited by Agnieszka Mossakowska-Wyszyńska

Institute Offices:

Research Affairs

Building of Radio Engineering - GR
ul. Koszykowa 75, 00-662 Warsaw, Poland
phone/fax (48) (22) 628 87 40, phone: (48) (22) 660 7777

Teaching Affairs

Building of Electronics - GE
ul. Nowowiejska 15/19, 00-665 Warsaw, Poland
phone/fax: (48) (22) 825 30 55, phone: (48) (22) 660 5349

Internet Information

<http://www.imio.pw.edu.pl>

From the Director

This Annual Report summarises the research activities of the Institute in 2003, as well as the teaching activities in the academic year 2002/2003. These activities of the Institute in the field of electronics and computer engineering are focused on system implementations in both microelectronic and optoelectronic applications. These two areas include VLSI systems, microelectronic and nanoelectronic semiconductor devices, hybrid circuits (e.g. microwave, optoelectronic), sensors, laser optoelectronics, electronic imaging and image processing. It is worth to emphasise, that we develop modelling and CAD as well as manufacturing and diagnostics - methods and tools in the above mentioned areas.

The Institute of Microelectronics and Optoelectronics (IMiO) was founded in 1970. It evolved from the Chair of Radio Engineering created by Professor Janusz Groszkowski in 1929. Our Institute is bounded up with a cradle of the Faculty of Electronics and Information Technology by the person of Professor Janusz Groszkowski who worked in IMiO until His last days of life, as well as by the territory - a half of our Institute is situated in the "Building of Radio Engineering". Here, we develop Technology Centre of the Faculty. It comprises laboratories of silicon processing (*clean room*), hybrid technologies and assembly techniques, fibre optic and integrated optoelectronic devices fabrication, laser optoelectronics and characterisation of new electronic and photonic materials and manufacturing processes. Among them the Centre of Photovoltaics (established in November 2002) developed its research and promotion activities basing significantly on a few projects within 5th UE Framework Programme.

Initiatives and creative efforts of the Institute's staff resulted in improvement of the research and teaching infrastructure and in research projects (national and international) carried out in the Institute, as well as in valuable publications and individual successes. In the field of teaching organisation the development (together with Institute of Electronic Systems) of a new speciality "Electronics and Computer Engineering" on stationary studies (and additionally of a speciality "Computer Engineering" for distance learning) was continued and new lectures were prepared. I believe that concepts and curricula of this new teaching speciality meet a challenge of the modern development of technology and information society.

I express my sincere appreciation to all colleagues for the big effort and all attainments, which determined the position of our Institute in the Faculty of Electronics and Information Technology. Thank you very much for friendly co-operation in creative and harmonious development of the Institute and for a compliance with high standards in all academic activities.

Warsaw, January 2004

Professor Andrzej Pfitzner, Ph.D., D.Sc.

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1. GENERAL INFORMATION

1.1. Organisation of the Institute and Areas of its Activities

The Institute of Microelectronics and Optoelectronics is a part of the Faculty of Electronics and Information Technology - the largest Faculty of the Warsaw University of Technology.

Our Institute consists of six divisions:

- Microelectronics and Nanoelectronics Devices Division;
 - VLSI Engineering and Design Automation Division;
 - Microwave Electronics and Photonics Division;
 - Optoelectronic and Hybrid Devices Division
 - Optoelectronics Division;
 - Image Processing Division;
- and two research and teaching groups: Vacuum Science and Technology Group, Characterization of Electronic Materials Group, which exist beyond the division structure.

The main activity of the Institute is focused now on system implementations in both microelectronics and optoelectronics. During the past thirty-three years the Institute has built up its competence in:

- modelling of physical effects in modern semiconductor devices;
- silicon processing and its modelling, non-standard dielectric layer deposition techniques;
- developing the methods and measuring systems for electronic materials and electronic devices studies;
- generation of microwaves, microwave measurement techniques, and numerical methods for electromagnetics;
- processing, designing, optimisation techniques and development of VLSI (very large scale integration of circuits) computer-aided tools;

- developing the hybrid circuits technology with special emphasis on thick-film technology and its applications to hybrid microwave integrated circuits;
- laser physics (Fabry-Perot and distributed feedback lasers), laser spectroscopy of solid state active materials, and applications of lasers in medicine, manufacturing and telecommunications;
- construction and characterisation of optoelectronics elements and devices including fibre sensors, photovoltaics;
- computer-aided design of photoelectronic image devices, image processing and visualisation of results of experiments with image devices;
- vacuum science and technology - computer-aided design of vacuum systems, modelling of the gas flow in vacuum systems, studies of gas parameter distribution in calibration chambers (vacuum metrology).

The research activities are supported by the grants from State Committee for Scientific Research and also by the European projects within 5-th Framework Program: PVNET, ENERBUILD, PV-EC-NET, REASON, PV Centre, and NATO for peace.

The results of our scientific activities were published in many paper submitted to prestigious international scientific journals and presented at national and mostly at international conferences in the form of communications as well as the invited lectures.

1.2. Board of Directors

Director of the Institute

Andrzej Pfitzner, Ph.D.,D.Sc. Professor
GR, room 239,
phone: 660 7533, 629 67 99
e-mail:apf@imio.pw.edu.pl

Deputy-Director for Research Affairs

Piotr Szwemin, Ph.D. Assistant Professor
GR, room 240,
phone: 660 7888, 625 73 95
e-mail:szwemin@imio.pw.edu.pl

Deputy-Director for Teaching Affairs

Elżbieta Piwowska, Ph.D. Assistant Professor
GE, room 159,
phone: 660 5349, 825 30 55
e-mail:piwowska@imio.pw.edu.pl

1.3. Microelectronics and Nanoelectronics Devices Division

Head of the Division

Andrzej Jakubowski, Ph.D., D.Sc. Tenured Professor
GR, room 337,
phone: 660 7534, 625 73 29
e-mail:jakubowski@imio.pw.edu.pl

Senior academic staff

Romuald B. Beck, Ph.D., D.Sc.,	Professor
Bogdan Majkusiak, Ph.D., D.Sc.,	Professor
Jan Szmidt, Ph.D., D.Sc.,	Professor
Lidia Lukasiak, Ph.D., D.Sc.,	Associate Professor
Małgorzata Jurczak, Ph.D.,	Assistant Professor
Zbigniew Pióro, Ph.D.,	Assistant Professor
Sławomir Szostak, Ph.D.,	Assistant Professor
Jakub Walczak, Ph.D.,	Assistant Professor
Aleksander Werbowy, Ph.D.,	Assistant Professor
Jan Gibki, Ph.D.,	Senior Lecturer
Józef Maciak, M.Sc.	Senior Lecturer
Antoni Siennicki, Ph.D.,	Senior Lecturer

Junior academic staff

Agnieszka Zareba, M.Sc.,	Assistant
Tomasz Bieniek, M.Sc.,	Ph.D. Student
Emil Dusiński, M.Sc.,	Ph.D. Student
Małgorzata Kalisz, M.Sc.,	Ph.D. Student
Andrzej Kociubiński, M.Sc.,	Ph.D. Student
Adam Linkowski, M.Sc.,	Ph.D. Student
Maung Than Htun Aung, M.Sc.,	Ph.D. Student
Robert Mroczyński, M.Sc.,	Ph.D. Student
Mariusz Sochacki, M.Sc.,	Ph.D. Student
Artur Szczęsny, M.Sc.,	Ph.D. Student
Mateusz Śmietana, M.Sc.,	Ph.D. Student
Paweł Śniecikowski, M.Sc.,	Ph.D. Student
Jarosław Żelazko, M.Sc.,	Ph.D. Student

Technical and administrative staff

Witold Ciemiewski,
Kazimierz Dalbiak,
Krzysztof Krogulski,
Małgorzata Trzaskowska.

The research carried out in the Microelectronics and Nanoelectronics Devices Division falls into three main areas, namely: technology, diagnostics and modelling of semiconductor structures, as well as applications of microelectronics in digital signal processing.

To name a few examples of its research topics:

- Modelling and investigation on kinetics of silicon oxidation (particularly of the beginning stages of the process);
- Diagnostics and characterisation of properties of single and double insulating layers (gate stack including ultrathin oxide layers) by means of electrical measurements analysis;
- Wear-out and degradation processes in MOS structures (breakdown of dielectrics layers, hot carriers effects, radiation damage effects);
- Transport mechanism and quantum effects in MOS structures (transistor, tunnel diode) with ultrathin oxide;
- New materials (semiconductors and dielectrics) for microelectronics applications (e.g.: diamond-like-carbon, borazone, silicon carbide, gallium nitride, silicon-germanium);
- Theoretical studies on MOS-SOI (silicon-on-insulator) and Si:Ge (silicon-germanium) MOS structure physics (modelling of devices behaviour and modelling for characterisation and diagnostics);
- Nanoelectronic phenomena and devices (e.g. tunnel and resonance tunnel diodes and transistors, Coulomb blockade diode, single-electron transistors, memories).
- PECVD deposition of ultrathin dielectric layers for MOSFET gate dielectric (SiO_2 , Si_3N_4 , SiO_xN_y).
- Very low temperature processing of test structure;
- MEMS/MOEMS processing.

1.4. VLSI Engineering and Design Automation Division

Head of the Division

Wiesław Kuźmicz, Ph.D., D.Sc. Professor
GE, room 355,
phone: 660 7207
e-mail:wbk@imio.pw.edu.pl

Senior academic staff

Andrzej Pfitzner, Ph.D., D.Sc.	Professor
Zbigniew Jaworski, Ph.D.	Assistant Professor
Mariusz Niewczas, Ph.D.	Assistant Professor
Elżbieta Piwowarska, Ph.D.	Assistant Professor
Witold Pleskacz, Ph.D.	Assistant Professor
Andrzej Wielgus, Ph.D.	Assistant Professor
Adam Wojtasik, Ph.D.	Assistant Professor

Junior academic staff

Grzegorz Janczyk, M.Sc.	Assistant, Ph.D. Student
Adam Jarosz, M.Sc.	Ph.D. Student
Włodzimierz Jońca, M.Sc.	Ph.D. Student
Adam Kowalczyk, M.Sc.	Ph.D. Student
Dominik Kasprowicz, M.Sc.	Ph.D. Student

Technical and administrative staff

Jerzy Gempel, M.Sc.
Stanisław Jeszka, M.Sc.

The research carried out in the division falls into main area: design of microelectronics IC's (integrated circuits) and application of microelectronics in digital signal processing.

To name a few examples of its research topics:

- methods of formal and functional verification of IC design: methods of verification of logical circuits, methods of determination of circuit topography sensitivity on spot defects;
- novel mathematical methods of technological processing modelling in application to statistical simulation;
- novel two-dimensional mathematical simulation of semiconductor devices.

Current research projects in the Division are as follows:

- methodologies of integrated circuit design for manufacturability: application of statistical process and device simulation in IC design, investigations of spatial on-chip correlation of random process disturbances, analysis of layout sensitivity to spot defects;
- design of analogue VLSI circuits: analogue implementations of

- fuzzy logic controllers with biomedical applications, methodologies of testing and design for testability of analogue VLSI integrated circuits;
- development of CAD tools for integrated circuit design and verification, with special emphasis on analogue full custom ASICs design;
- investigations of signal propagation and crosstalk in long interconnections in submicron VLSI circuits;
- design of digital and mixed VLSI circuits for special applications: CNN, data processing in physical experiments, etc.;
- fully integrated CMOS implementation of electronic circuits for spread spectrum communication based on chaos generators.

1.5. Microwave Electronics and Photonics Division

Head of the Division

Bogdan Galwas, Ph.D., D.Sc. Tenured Professor
GE, room 51,
phone: 660 7939, 825 03 93
e-mail: B.Galwas@elka.pw.edu.pl

Senior academic staff

Jerzy Piotrowski, Ph.D. Assistant Professor
Piotr Witoński, Ph.D. Assistant Professor
Agnieszka Szymańska, Ph.D. Assistant Professor
Bernard Jakubowski, Ph.D. Senior Lecturer
Jerzy Skulski, M.Sc. Senior Lecturer

Junior academic staff

Jarosław Dawidczyk, M.Sc. Assistant, Ph.D. Student
Robert Rajkowski, M.Sc. Ph.D. Student

Technical and administrative staff

Bożena Janus

The research activity of the Microwave Electronics and Photonics Division is concerned with propagative electronics and microwave photonics. The characteristic feature of the electronics branch is the comparability between the time of system state change and the time of signal propagation between particular system points.

The research activity of the Microwave Electronics and Photonics Division is concentrated on:

- an analysis of the oscillation conditions, frequency stabilisation and synthesis in microwave bands;
- measurement techniques of microwave circuits and devices parameters with emphasis on automation and computerisation of measurement methods;
- analysis methods of transmission lines for modern mm-wave microwave integrated circuits.

From the new topics of research activity we can mention:

- modelling and computer aided design of microwave devices and circuits;
- microwave sensors for industrial applications;
- controlling of microwave circuits parameters by means of optical signals;
- investigations and modelling of optical-microwave frequency conversion processes;
- modelling of optically controlled microwave devices, as photodiodes, photovaractors, phototransistors;
- modelling of semiconductor optical devices for telecommunication;
- optoelectronic and microwave devices for data transmission networks.

1.6. Optoelectronic and Hybrid Devices Division

Head of the Division

Jerzy Kruszewski, Ph.D., D.Sc. Professor
GR, room 426,
phone: 660 7776
e-mail:kruszewski@imio.pw.edu.pl

Stanisław Pietruszko, Ph.D., Assistant Professor
Zbigniew Szczepański, Ph.D., Assistant Professor
Maria Bebłowska, Ph.D., Senior Lecturer

Junior academic staff

Paweł Wrzosek, M.Sc. Ph.D. Student

Senior academic staff

Michał Borecki, Ph.D., Assistant Professor
Agata Jasik Ph.D., Assistant Professor
Jerzy Kalenik, Ph.D., Assistant Professor
Ryszard Kisiel, Ph.D., Assistant Professor
Krystyna Lachowska, Ph.D., Assistant Professor

Technical and administrative staff

Ryszard Biaduń,
Marcin Grądzki, B.Sc.
Artur Mikołajuk, M.Sc.
Krystyna Szyłko.

The research activity of the Division concentrates on optoelectronic and hybrid devices. Fundamental and applied research are carried out. Research groups are organised for defined tasks.

The main research areas are as follows:

- fabrication and investigation of the following optoelectronic devices: integrated passive and active lightwave guiding structures (modulators, bistable switches etc.) and fibre optic sensors;
- computer engineering for fibre optics;
- new techniques of surface mounted devices on PCB (printed circuit boards);
- application of thin and thick film technology in hybrid devices and thick film sensors fabrication,
- electronic packaging technology,
- investigation of the electronic structure, stability and optical properties of amorphous silicon and its devices (thin film

transistors, solar cells, etc.),

- research, design and monitoring of photovoltaic systems, strategy for development of photovoltaic solar energy.

The Centre of Photovoltaics established in the Division in November 2002 is active in the following areas:

- design, installation and investigation of stand-alone and grid-connected photovoltaics systems as well as investigation and testing photovoltaics module,
- investigation of amorphous silicon and its devices,
- preparation of documents on the current status, perspectives, and strategy of developing photovoltaics in Europe and Poland as well as the legal, administrative and financial conditions of introducing PV in Poland.

1.7. Optoelectronics Division

Head of the Division

Michał Malinowski, Ph.D., D.Sc., Professor
GR, room 035,
phone: 660 7783
e-mail: m.malinowski@elka.pw.edu.pl

Senior academic staff

Paweł Szczepański, Ph.D., D.Sc. Tenured Professor
Tadeusz Adamowicz, Ph.D., D.Sc. Assistant Professor
Jerzy Kęsik, Ph.D. Assistant Professor
Agnieszka Mossakowska-Wyszyńska, Ph.D. Assistant Professor
Ryszard Piramidowicz, M.Sc. Assistant Professor
Anna Tyszka-Zawadzka, Ph.D. Assistant Professor
Piotr Warda, M.Sc. Assistant Professor

Junior academic staff

Paweł Czuma, M.Sc. Ph.D. Student
Marcin Kaczkan, M.Sc. Ph.D. Student
Wojciech Kamiński, M.Sc. Ph.D. Student
Monika Kowalska, M.Sc. Ph.D. Student
Kamila Leśniewska-Matys, M.Sc. Ph.D. Student
Magdalena Nakielska, M.Sc. Ph.D. Student
Robert Paszkiewicz, M.Sc. Ph.D. Student

Technical and administrative staff

Marek Markiewicz,

in the field of laser physics, laser spectroscopy, laser construction and laser applications in medicine and air pollution monitoring.

The academic staff of the Division gives lectures in photonics, laser physics, laser technology, laser applications, laser spectroscopy, integrated optoelectronics and optical computing, all of which are accompanied by appropriate laboratory class activities.

The main research activity of the Division comprises:

- solid state laser construction and their applications in materials processing;
- spectroscopic research of new laser materials, investigation of the excitation processes in rare earth doped dielectric materials, research of blue up-conversion laser structures, waveguide lasers;
- theoretical research of laser generation in planar, fibre and hollow waveguide gas lasers, analysis of light generation in DFB (distributed feedback) structures, photonic crystals structures and in lasers with non-linear optical elements, investigation of the statistical properties of the light generated in various laser structures;
- nano-optical structures and photonic band-gap materials;
- research of light generation in metal vapour gas lasers, measurement of laser parameters, investigation of light generation in hollow cathode lasers, analysis of plasma discharge processes, research of the optogalvanic effect;
- optimisation of the construction of ion gas lasers, investigation of the processes in discharge tube ceramic ion laser and laser operation in various cavity geometry, investigation of light generation in ion gas lasers for medical applications.

The activity of the Optoelectronics Division is concentrated on education as well as on various areas of optoelectronic research

1.8. Image Processing Division

Head of the Division

Jerzy Woźnicki, Ph.D., D.Sc. Tenured Professor
 GE, room 156,
 phone: 660 7784, 825-73-61
 e-mail: frpfund@nbox.pw.edu.pl

Senior academic staff

Grzegorz Kukielka, Ph.D. Assistant Professor
 Janusz Parka, Ph.D., D.Sc. Assistant Professor
 Hanna Górkiewicz-Galwas, Ph.D. Senior Lecturer

Junior academic staff

Tomasz Grudniewski, M.Sc. Ph.D. Student

Technical and administrative staff

Jerzy Domański, M.Sc.

The main areas of activity of the Division are education and research, both in the field of the technology of electronic imaging devices and of digital image processing. Members of the academic staff are involved in research and development works on:

- theoretical principles of image modelling;
- numerical methods of image analysis;
- implementation of digital image processing for detection, inspection and identification of objects;
- application of image processing methods for diagnostic control and measurement systems in industry, medicine, research and commerce;
- electrooptic effects in liquid crystals and their applications to LCD;
- photorefractive phenomena in liquid crystals for dynamic holography and optical data storage

1.9. Vacuum Science and Technology Group

Head of the Group

Piotr Szwemin, Ph.D. Assistant Professor
 GR, room 240,
 phone: 660 7888, 625 73 95
 e-mail: szwemin@imio.pw.edu.pl

Senior academic staff

Marek Niewiński, M.Sc. Lecturer, Ph.D. Student

Technical and administrative staff

Piotr Karwański.

The research work of the Vacuum Technology Team is concentrated on the three main fields:

- vacuum metrology (adaptation of Polish rules to European standards),
- gas flow simulation in vacuum systems, specially in metrological primary standard systems based on continuous expansion method,
- development of CAD of vacuum systems.

These works are focused on modelling of low-pressure standards.

1.10. Characterization of Electronic Materials Group

Head of the Group

Jerzy Krupka, Ph.D., D.Sc. Professor,
 GE, room 364,
 phone: 660 7693
 e-mail: krupka@imio.pw.edu.pl

Senior academic staff

Mikołaj Baszun, Ph.D. Assistant Professor
 Zdzisław Mączyński, Ph.D. Assistant Professor
 Janusz Rogowski, Ph.D. Senior Lecturer

Junior academic staff

Paweł Popow, M.Sc. Ph.D. Student
 Tomasz Zychowicz, M.Sc. Ph.D. Student

Technical and administrative staff

Zbigniew Rudkowski.

The research activity of the Group of Characterization of Electronic Materials concentrates on electronic materials and sensors.

The main aims of this research are connected with ultrasensitive quantitative analysis of electromagnetic, electric, magnetic and piezoelectric phenomena for materials applied in electronic systems and microsystems. Especially such measurements obey ultralow temperatures and ultrahigh microwave frequencies. Also SAW sensors are designed and produced.

1.11. Statistical Data

SPECIFICATION	2002	2003	DIFFERENCE
Academic staff	80	84	+4
Tenured professors	5	4	-1
Professors	7	7	0
Associate professors	2	1	-1
Assistant professors	30	32	+2
Senior lecturers	6	8	+2
Lecturers	1	1	0
Assistants and Ph.D. students	29	31	+2
Technical staff	17	15	-2
Administrative staff	5	4	-1
Space	3254,9	3254,9	0
Teaching laboratories	1275,9	1275,9	0
Other laboratories	341,3	341,3	0
Offices of academic staff	1637,7	1637,7	0
Computers	291	302	+11
Library resources	9597	9626	+29
Books (number of volumes)	9597	9626	+29
Journals (number of titles subscribed to)	0	0	0
Teaching activities	65	64	-1
Basic courses	53	51	-2
Advanced courses	10	10	0
Special courses	2	3	+1
Research projects	52	55	+3
Granted by the University	20	24	+4
Granted by State Institutions	20	19	-1
Granted by International Institutions	11	11	0
Other projects	1	1	0
Degrees awarded	82	104	+22
D.Sc. degrees	1	1	0
Ph.D. degrees	6	4	-2
M.Sc. degrees	32	48	+16
B.Sc. degrees	43	51	+8
Publications	154	166	+12
Sci.-tech. books	4	5	+1
Sci.-tech. papers in journals	55	48	-7
Sci.-tech. papers in conference proceedings	95	113	+18
Reports	44	42	-2
Patents	1	2	+1
Conferences	67	62	-5
Organised by the Institute	4	1	-3
Others	63	61	-2

2. STAFF

2.1. Senior Academic Staff

- Tadeusz Adamowicz**, M.Sc. ('62), Ph.D. ('73), Quantum Electronics, Gas Discharges; Assistant Professor, full time, Optoelectronics Division, Member of Plasma Physics Section at the Committee of Physics of the Polish Academy of Sciences ('94-), Member of IEEE ('99) room # 125 GR
phone: 660-7778
e-mail: adamowicz@imio.pw.edu.pl
- Mikołaj Baszun**, M.Sc. ('69), Ph.D. ('77), Electronic Sensors, Assistant Professor, full time, Characterization of Electronic Materials Group room # 371 GE
phone: 660-7908
e-mail: baszun@imio.pw.edu.pl
- Maria Beblowska**, M.Sc. ('63), Ph.D. ('78), Optoelectronic Devices, Senior Lecturer, part time, Optoelectronic and Hybrid Devices Division, Member of SEP Society of Polish Electricians ('80-) room # 424 GR
phone: 660-7785
e-mail: beblowska@imio.pw.edu.pl
- Romuald B. Beck**, M.Sc. ('76), Ph.D. ('82), D.Sc. ('96), Microelectronics, Electronics, Associate Professor, full time, Microelectronics and Nanoelectronics Devices Division, Leader of the Technology, Diagnostics and Modelling Group ('85-), Member of the Microelectronics Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('93-), Member of IEEE ('97-), Member of Electrochemical Society ('98-) room # 336 GR
phone: 625-7329, 660-7534
fax: 625-73-29
e-mail: beck@imio.pw.edu.pl
- Michał Borecki**, M.Sc. ('91), Ph.D. ('96), CAD, Optoelectronics, Assistant Professor, full time, Optoelectronic and Hybrid Devices Division, Member of Optoelectronics Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('99-), Member of SEP Society of Polish Electricians ('99-) room # 537 GR
phone: 660-7749
fax: 628-8740
e-mail: borecki@imio.pw.edu.pl
- Bogdan Galwas**, M.Sc.('62), Ph.D. ('69), D.Sc. ('76), Microelectronics, Microwave Electronics, Tenured Professor, full time, Head of Microwave Electronics and Photonics Division ('84-), Pro-Rector of WUT ('87-90), Member of Electronics and Telecommunications Committee of the Polish Academy of Sciences ('88-), Member of Scientific Council of Industrial Institute of Telecommunications ('90-), Chairman of the International Management Committee of the International Travelling Summer Schools ('91-), Director of Ph.D. Studies in Electronics and Telecommunications ('92-), Member of IEEE ('94-), Member of Scientific Council of Institute of Telecommunications ('97-), Member of IACEE ('97-), Member of SEFI ('97-), Rector's Plenipotentiary for New Technologies and Forms of Education ('99-), Director of Warsaw University of Technology Center for Distance Learning – OKNO ('00-) room # 51 GE
phone: 660-7939, 825-03-93
fax: 825-03-93
e-mail: B.Galwas@elka.pw.edu.pl
- Jan Gibki**, M.Sc. ('74), Ph.D. ('97), Electronics, Automatics, Senior Lecturer, full time, Microelectronics and Nanoelectronics Devices Division room # 275 GE
phone: 660-75-35
fax: 625-73-29
e-mail: gibki@imio.pw.edu.pl
- Hanna Górkiewicz-Galwas**, M.Sc. ('60), Ph.D. ('69), Image Processing Techniques, Senior Lecturer, full time, Image Processing Division, Chairman of Organization Committee of the Conference on Image Processing Techniques TPO ('88,'93,'97,'02) room # 148 GE
phone: 660-7780, 825-73-61
e-mail: gorkiewicz@imio.pw.edu.pl
- Andrzej Jakubowski**, M.Sc. ('63), Ph.D. ('73), D.Sc. ('83), Electronics, Microelectronics, Full Professor, full time, Microelectronics and Nanoelectronics Devices Division (2001-), Head of Microelectronics Division ('84-01), Member of Faculty Council ('77-), Member and Vice-Chairman of the Electronics and Telecommunications Committee of the Polish Academy of Sciences, Head of its Microelectronics Section ('88-03), Pożaryski Award for Scientific Publications ('86, '96), Member of Programme Committee of ELTE ('84-), MiEL ('94-), IWSPD ('96-), MIXDES ('97-), IEEE ICCDS ('02-), Chairman of "Diagnostic and Yield" ('88-), Editor of "Electron Technology" ('89-94) room # 337 GR
phone: 660-7773, 625-7329
fax: 625-73-29
e-mail: a.jakubowski@imio.pw.edu.pl
- Bernard Jakubowski**, M.Sc. ('72), Ph.D. ('81), Microelectronics, Microwave Electronics, Senior Lecturer, 1/4 time Microwave Electronics and Photonics Division room # 50 GE
phone: 660-7939, 825-03-93
fax: 825-03-93

- Agata Jasik**, M.Sc.(’95), Ph.D. (’02), Electron Technology, Assistant Professor, part time, room # 424 GR
Optoelectronic and Hybrid Devices Division phone: 660-7785
e-mail: jasik@imio.pw.edu.pl
- Zbigniew Jaworski**, M.Sc. (’90), Ph.D. (’97), Microelectronics, Assistant Professor, full time, room # 354 GE
VLSI Engineering and Design Automation Division, Member of IEEE (’95-) phone: 660-7207
fax: 825-8203
e-mail: jaworski@imio.pw.edu.pl
- Małgorzata Jurczak**, M.Sc. (’91), Ph.D. (’97), Microelectronics, Assistant Professor, full time, room # 339 GR
Microelectronics and Nanoelectronics Devices Division, Rector’s Group Award for Scientific phone: 660-7773
Achievements (’96), Best Paper Award on 30th European Solid-State Device Research fax: 625-73-29
Conference – ESSDERC’2000 e-mail: jurczak@imio.pw.edu.pl
- Jerzy Kalenik**, M.Sc. (’79), Ph.D. (’89), Electron Technology, Assistant Professor, full time, room #428 GR
Optoelectronic and Hybrid Devices Division, Member of ISHM Poland Chapter (’84-), Dean's phone: 660-7851
Plenipotentiary for Students Industrial Training (’91-) fax: 628-8740
e-mail: kalenik@imio.pw.edu.pl
- Jerzy Kęsik**, M.Sc. (’67), Ph.D. (’77), Optoelectronic, Laser technology, Assistant Professor, full room # 125A GR
time, Optoelectronics Division, Prime Minister Prize for remarkable technical and science phone: 660-7145
national achievement (’00) e-mail: kesik@imio.pw.edu.pl
- Ryszard Kisiel**, M.Sc. (’74), Ph.D. (’83), Electron Technology, Assistant Professor, full time, room # 425 GR
Optoelectronic and Hybrid Devices Division, Member of ISHM Poland Chapter (’87-), phone: 660-7852
Member of Editorial Board of "Elektronika" (’94-), Vice President of IMAPS Poland (’99- fax: 628-8740
’01), Member of Scientific Committee of IMAPS-Poland Chapter (’00-), Member of IEEE e-mail: kisiel@imio.pw.edu.pl
CPMT Society (’00-)
- Jerzy Krupka**, M.Sc. (’73), Ph.D. (’77), D.Sc. (’89), Microwave Theory and Technique, room # 364 GE
Professor, full time, Characterization of Electronic Materials Group, Member of the Faculty phone: 660-7693
Council (’89-), Member of Microwave Section of the Electronics and Telecommunication fax: 825-30-55
Committee of the Polish Academy of Sciences (’96-), Member of Editorial Board of IEEE e-mail: krupka@imio.pw.edu.pl
Trans. Microwave Theory Tech. (’94-), Best Paper Award in Journal Measurements, Science
and Technology (’99), Head of Characterization of Electronic Materials Group (’00-), Senior
Member of IEEE (’01), Member of IOP Institute of Physics UK (’01-)
- Jerzy Kruszewski**, M.Sc. (’61), Ph.D. (’70), D.Sc. (’86), Electron Technology, Optoelectronic, room # 426 GR
Professor, full time, Optoelectronic and Hybrid Devices Division, Member of Polish Chapter phone: 660-7776
SPIE (’82-), Head of Optoelectronic and Hybrid Devices Division (’86-), Member of Polish fax: 660-7776
Committee of Optoelectronics of SEP Society of Polish Electricians (’86-), Member of the e-mail: kruszewski@imio.pw.edu.pl
Faculty Committee: of Scientific Investigation of Curriculum (’90-), Member of Mat.
Research Society (’90-), Head of Optoelectronic and Hybrid Devices Division (’00-)
- Grzegorz Kukielka**, M.Sc. (’92), Ph.D. (’01), Image Processing Techniques, Assistant room # 149 GE
Professor, full time, Image Processing Division, Favourably Evaluated and Credited at The phone: 660-7780
Chief Technical National Competition Organisation for The Best M.Sc. Paper in the Field of e-mail: g.kukielka@altkom.com.pl
Optoelectronics (’92), Member of Microsoft Certified Professional (’98-), Affiliate Member of
Computer Society IEEE (’99-)
- Wiesław Kuźmicz**, M.Sc. (’70), Ph.D. (’74), D.Sc. (’86), Microelectronics and VLSI Design, room # 355 GE
Professor, full time, VLSI Engineering and Design Automation Division, Member of IEEE phone: 660-7207
(’85-), Member of the Faculty Council (’87-), Member of the Faculty Council Research fax: 825-82-03
Committee (’93-), Member of the Committee for Electronics and Telecommunication of the e-mail: wbk@imio.pw.edu.pl
Polish Academy of Sciences (’93-’03), Member of the Scientific Council, Institute of Electron
Technology (’95-’03) Member of the Faculty Council Awards Committee (’96-), Head of
VLSI Engineering and Design Automation Division (’00-), Member of Societas Scientiarum
Varsoviensis (’02-)
- Krystyna Lachowska**, M.Sc. (’64), Ph.D. (’80), Electron Technology, Assistant Professor, full room # 428 GR
time, Optoelectronic and Hybrid Devices Division phone: 660-7851
e-mail: lachowska@imio.pw.edu.pl

- Lidia Łukasiak**, M.Sc. ('88), Ph.D. ('94), D.Sc. ('02), Microelectronics, Assistant Professor, full time, Microelectronics and Nanoelectronics Devices Division, Rector's Award for Scientific Achievements ('96), Prime Minister's Award for Distinguished Ph.D. Thesis ('95), Scientific Secretary of the Microelectronics Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('96-03), Co-Chairman Conference "Diagnostics and Yield" ('00-), Member of Programme Comm. IEEE ICCDS ('02-), Programm Chairman of "Diagnostics and Yield" ('03) room # 362 GE
phone: 660-7907
fax: 625-73-29
e-mail: lukasiak@imio.pw.edu.pl
- Józef Maciak**, Eng. ('68), M.Sc. ('88), Electronics, Electronics Measurements, Lecturer, full time, Microelectronics and Nanoelectronics Devices Division room # 274 GE
phone: 660-77-75
fax: 625-73-29
e-mail: maciak@imio.pw.edu.pl
- Bogdan Majkusiak**, M.Sc. ('79), Ph.D. ('85), D.Sc. (91), Microelectronics, Professor, full time, Microelectronics and Nanoelectronics Devices Division, Scientific Secretary of the Microelectronics Section of the Electronics Telecommunication Committee PAN ('89-'96) and member ('96-), Member of the IEEE ('92-), Member of Curriculum Committee ('93-99), Associate Dean for Academic Affairs ('96-99), Senior Associate Dean ('99-'02) room # 233a GR
phone: 660-7773; 625-7329
fax: 625-73-29
e-mail: majkusiak@imio.pw.edu.pl
- Michał Malinowski**, M.Sc. ('79), Ph.D. ('85), D.Sc. ('90), Electronic, Optoelectronic, Professor, full time, Optoelectronics Division, Member of Faculty Council ('90-), Member of Curriculum Committee I ('94-), Member of Optoelectronics Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('94-), Member of SEP Society of Polish Electricians ('96-), Head of Optoelectronics Division ('99-) room # 035 GR
phone: 660-7783
fax: 621-8740
e-mail: malinowski@imio.pw.edu.pl
- Zdzisław Mączyński**, M.Sc. ('66), Ph.D. ('75), Magnetic Measurement and Instrumentation, Senior Lecturer, full time, Characterization of Electronic Materials Group, Member of the Faculty Council ('81-), Associate Dean for Faculty Students Affairs ('96-) room # 367, 112 GE
phone: 660-7901, 825-37-58
fax: 825-19-84
e-mail: maczenski@elka.pw.edu.pl
- Agnieszka Mossakowska-Wyszyńska**, M.Sc. ('91), Ph.D. ('96) with distinction, Optoelectronics, Quantum Electronics, Assistant Professor, full time, Optoelectronics Division, Grant from Foundation of Polish Science ('95), Secretary of Optoelectronics Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('96-), Member of SEP Society of Polish Electricians ('96-), Prime Minister Prize for dissertation thesis ('97), Editor of Annual Report of Institute of Microelectronics and Optoelectronics ('00-), Member of SPIE Polish Chapter ('02-) room # 120 GR
phone: 660-7246
fax: 628-8740
e-mail: amossako@elka.pw.edu.pl
- Mariusz Niewczas**, M.Sc. ('88), Ph.D. ('96), Microelectronics, CAD, Assistant Professor, on leave in PDF Solutions Inc. USA, VLSI Engineering and Design Automation Division, Member of IEEE ('88-) room # 357 GE
phone: 660-7207
fax: 825-82-03
e-mail: mn@imio.pw.edu.pl
- Marek Niewiński**, M. Sc. ('91), Vacuum Science and Technology, part time Lecturer, Vacuum Technology Group room # 539 GR
phone: 660-7781
e-mail: niewinski@imio.pw.edu.pl
- Janusz Parka**, M. Sc ('77), Ph. D. ('84), D. Sc. ('01), Material Science, Engineering of Liquid Crystals, Associate Professor, half time, Image Procession Division, Member of International Society for Optical Engineering, Polish Chapter, Member of International Board of Optics of Liquid Crystals ('03-'08) room #157 GE
phone: 825 73 61, 660 77 80
fax: 660 54 19
e.mail: jparka@wat.edu.pl
- Andrzej Pfitzner**, M.Sc. ('74), Ph.D. ('78), D.Sc. ('99), Microelectronics, Professor, full time, VLSI Engineering and Design Automation Division, Member of the Faculty Council ('90-), Deputy-Director for Teaching Affairs ('91-'99), Member of the Dean's Financials Commission ('93-99), Member of the „MIXDES” International Programme Committee ('94-) (Mixed Design of Integrated Circuits and Systems), Director of the Institute ('99-), Member of the Programme Committee of the Conference "Electron Technology" ('99-), Member of the Microelectronics Section of the Committee for Electronics and Telecommunication of the Polish Academy of Sciences ('99-), Member of the Senat Financials Commission ('02-) room # 360 GE
phone: 660-7207
fax: 825-82-03
e-mail: apf@imio.pw.edu.pl

- Stanisław M.Pietruszko**, M.Sc.(71), Ph.D. (81), Microelectronics and Semiconductors; Photovoltaics, Assistant Professor, full time, Optoelectronic and Hybrid Devices Division, Member of Materials and Technology Section of the Electronics and Telecommunications Committee of Polish Academy of Sciences (86-), Member of American Physics Society (87-), Member of Materials Research Society, USA (87-), Member of the Polish Chemical Society (88-), Member of International Solar Energy Society (88-), Member of Polish Committee of Optoelectronics (90-), Member of Editorial Board of WREN News Letter, Member of IEEE (90-), Member of International Steering Committee of the World Renewable Energy Congress (90-), Associate Member of the International Centre for Theoretical Physics, Trieste, Italy (91-), Member of International Association for Solar Energy Education (92-), Founder Member of World Renewable Energy Network (92-), Member of International Organising Committee of ENERGEX (93-), Expert of European Communities in the area of renewable energy (97-) and for evaluation project in 5FP (99-02), President of the Central Europe International Energy Foundation Regional Headquarters (01-)
- room # 26 GR
phone: 660-7782
fax: 628-8740
e-mail: pietruszko@imio.pw.edu.pl
- Jerzy K.Piotrowski**, M.Sc. (75), Ph.D. (88) with honours, Microwave and Lightwave Techniques, Assistant Professor, full time, Microwave Electronics and Photonics Division, Member of IEEE (89-), Chairman of the IEEE AP/AES/MTT Joint Chapter (Poland Section) (00-)
- room # 52 GE
phone: 660-5394
fax: 825-03-93
e-mail: piotrowski@imio.pw.edu.pl
- Zbigniew Pióro**, M.Sc. (71), Ph.D. (75), Electronics, Microelectronics, Assistant Professor, 0,33 time, Microelectronics and Nanoelectronics Devices Division
- room # 362 GE
phone: 660-7907
fax: 625-73-29
e-mail: zbyszekp@abmicro.com.pl
- Ryszard Piramidowicz**, M.Sc. (94), Ph.D. (00) with distinction, Optoelectronics, Assistant Professor, full time, Optoelectronics Division, Member of SEP Society of Polish Electricians (96-)
- room # 034 GR
phone: 660-5047
e-mail: R.Piramidowicz@elka.pw.edu.pl
- Elżbieta Piwowarska**, M.Sc. (83), Ph.D. (95) with honours, Microelectronics, Assistant Professor, full time, VLSI Engineering and Design Automation Division, Member of the Faculty Council (96-), Rector's Award for Scientific Achievements (96), Deputy-Director for Teaching Affairs (99-), Member of the Dean's Financial Commission (99-), Member of the Microelectronics Section of the Committee for Electronics and Telecommunication of the Polish Academy of Sciences (00-)
- room # 359 GE
phone: 660-7207
fax: 825-82-03
e-mail: piwowarska@imio.pw.edu.pl
- Witold Pleskacz**, M.Sc.(83), Ph.D. (95) with honours, Microelectronics, CAD, Assistant Professor, full time, VLSI Engineering and Design Automation Division, Rector's Award for Scientific Achievements(89), Member of the Faculty Council (99-02), Rector's Award for Scientific Achievements(96), "Golden Chalk" - Student Council of the Faculty Teaching Award (00), Member of the "CADSM" International Programme Committee (International Conference - the Experience of Designing and Application of CAD Systems in Microelectronics) (01-), Member of the "YOT" Programme Committee (IEEE International Workshop on Yield Optimization & Test) (01-), Member of the "DFT" Programme Committee (IEEE International Symposium on Defect and Fault Tolerance in VLSI Systems) (02-)
- room # 359 GE
phone: 660-7207
fax: 825-82-03
e-mail: pleskacz@imio.pw.edu.pl
- Janusz Rogowski**, M.Sc. (62), Ph.D. (77), Magnetic Measurement and Instrumentation, Senior Lecturer, full time, Characterization of Electronic Materials Group
- room # 367 GE
phone: 660-7901
e-mail: rogowski@imio.pw.edu.pl
- Antoni Siennicki**, M.Sc. (68), Ph.D. (90), Solid State Electronics, Senior Lecturer, full time, Microelectronics and Nanoelectronics Devices Division, Member and Scientific Secretary of the Electronics and Telecommunication Committee of the Polish Academy of Sciences (78-83)
- room # 284 GE
phone: 660-7535
e-mail: siennicki@imio.pw.edu.pl
- Jerzy Skulski**, M. Sc. (70), Microwave Electronics, Senior Lecturer, full time, Microwave Electronics and Photonics Division
- room # 54 GE
phone: 660-7348
fax. 825-03-93
e-mail: jskulski@imio.pw.edu.pl

- Pawel Szczepański**, M.Sc. (81), Ph.D. (88), D.Sc. (94), Optoelectronics, Tenured Professor, full time, Optoelectronics Division, Member of Faculty Council (94-), Member of SEP Society of Polish Electricians (96-), Member of Optoelectronics Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences (96-), Member of Optical Society of America (96-), Editor of Journal of Telecommunications and Information Technology (98-), Member of SPIE Polish Chapter (02-)
room # 119 GR
phone: 660-7246
e-mail: P.Szczepanski@elka.pw.edu.pl
- Zbigniew Szczepański**, M.Sc. (62), Ph.D. (71), Electronics Technologies, Assistant Professor, full time, Optoelectronic and Hybrid Devices Division, Member of ISHM Poland Chapter (82-), Member of Scientific Committee of IMAPS Poland - Chapter (94-), Member of Scientific Committee of INSEL Conference (95-), Vice-President of IMAPS-Poland (97-99)
room # 242 GR
phone: 660-7704
fax: 628-8740
e-mail: z.szczepanski@imio.pw.edu.pl
- Jan Szmidt**, M.Sc. (76), Ph.D. (84), D.Sc. (95), Microelectronics, Electron Technology, Associate Professor, full time, Microelectronics and Nanoelectronics Devices Division, V-ce Deen of the Faculty (2002-). Member and Scientific Secretary of the Electronics and Telecommunication Committee of the Polish Academy of Sciences (96-). Member of the Microelectronics Section and of the Electronics and Telecommunication Committee of the Polish Academy of Sciences- Chairman of the Section (93-), Member of the Materials and Electronic Technology Section of the Polish Academy of Sciences- Chairman of the Section (03-), Member of Faculty Council (95-), Rector's Award for Scientific Achievements (96-), Member of IEEE (97-), Member of Senate Committee for University Organization (99-), Member of Program and Organization Committee for International Workshop and Summer School „Microtherm'98”, Microtherm'00 (co-chairman), Member of Program Committee at International Conference „Diagnostics and Yield”, Member of Section 8T11B State Committee for Scientific Research (00-)
room # 338 GR
phone: 625-7329, 660-7599
fax: 625-73-29
e-mail: szmidt@imio.pw.edu.pl
- Slawomir Szostak**, M.Sc. (95), Ph.D. (01), Microelectronics, Assistant Professor, full time, Microelectronics and Nanoelectronics Devices Division, Rector's Award for Scientific Achievements (02)
room # 362 GE
phone: 660-7907
fax: 625-73-29
e-mail: szostak@imio.pw.edu.pl
- Piotr Szwemin**, M. Sc. (64), Ph.D. (75), Vacuum Science and Technology, Assistant Professor, full time, Vacuum Technology Group, Head of Vacuum Technology Group (90-), Member of Executive Council of PVS (82-), Deputy-Director for Research Affairs (92-), Member of VSD of IUVSTA (93-), Member of Program Committee of EVC 5 and EVC 7, Chairman of Org. Committee 4KKTP, 5KKTP (96-99), ELTE (94, '97, '00) Member of Program Committee of 4KKTP and 5 KKTP, Chairman of Vacuum Science Division of PVS (96-), Member of Program Committee of 13th Int. Vacuum Workshop (02)
room # 240 GR
phone: 660 7888, 625-7395
fax: 628-8740
e-mail: szwemin@imio.pw.edu.pl
- Agnieszka Szymańska**, M.Sc. (97), Ph.D. (02), Microwave Electronics, Optoelectronics, Assistant Professor, 0,9 time, Microwave Electronics and Photonics Division, Member of SPIE (97-)
room # 53a GE
phone: 660-7994
fax: 825-03-93
e-mail: A.Szymanska.1@elka.pw.edu.pl
- Anna Tyszka-Zawadzka**, M.Sc. (91), Ph.D. (96) with distinction, Optoelectronics, Quantum Electronics, Assistant Professor, full time, Optoelectronics Division, Grant from Foundation of Polish Science (95), Member of SEP Society of Polish Electricians (96-), Prime Minister Prize for dissertation thesis (97)
room # 120 GR
phone: 660-7246
fax: 628-8740
e-mail: a.tyszka@imio.pw.edu.pl
- Jakub Walczak**, M.Sc. (96), Ph.D. (02), Microelectronics, Assistant Professor, full time, Microelectronics and Nanoelectronics Devices Division
room # 234a GR
phone: 660-7773; 625-7329
fax: 625-73-29
e-mail: walczak@imio.pw.edu.pl
- Piotr Warda**, M.Sc. (89), Ph.D. (98) with distinction, Optoelectronics, Assistant Professor, full time, Optoelectronics Division, Member of SEP Society of Polish Electricians (99-), Prime Minister Prize for remarkable technical and science national achievement (00)
room # 125A GR
phone: 660-7772
e-mail: P.Warda@elka.pw.edu.pl
- Aleksander Werbowy**, M.Sc. (94), Ph.D. (99), Microelectronics, Assistant Professor, full time, Microelectronics and Nanoelectronics Devices Division, Rector's Award for Scientific Achievements (00)
room # 233a GR
phone: 660-7773; 625-7329
fax: 625-73-29
e-mail: werbowy@imio.pw.edu.pl

- Andrzej Wielgus**, M.Sc. ('92), Ph.D. ('03), Microelectronics, Assistant Professor, full time, VLSI Engineering and Design Automation Division, Member of IEEE ('95-)
 room # 354 GE
 phone: 660-7207
 fax: 825-8203
 e-mail: wielgus@imio.pw.edu.pl
- Piotr Witoński**, M.Sc. ('94), Ph.D. ('00), Microwave Electronics, Optoelectronics, Assistant Professor, full time, Microwave Electronics and Photonics Division, Member of SEP Society of Polish Electricians ('96-)
 room # 56 GE
 phone: 660-7949
 fax: 825-03-93
 email: P.Witonski@elka.pw.edu.pl
- Adam Wojtasik**, M.Sc.('83), Ph.D.('95) with honours, CAD, Assistant Professor, full time, VLSI Engineering and Design Automation Division, Rector's Award for Scientific Achievements ('89), Ministry of National Education Award for Teaching Achievements in Microelectronics ('93), Rector's Award for Scientific Achievements ('96)
 room # 353 GE
 phone: 660-7207
 fax: 825-82-03
 e-mail: wojtasik@imio.pw.edu.pl
- Jerzy Woźnicki**, M.Sc. ('70), Ph.D. ('79), D.Sc. ('88), Image Processing Techniques, Tenured Professor, full time, Image Processing Division, Head of Image Processing Division ('87-), Member of the Polish Section of SPIE ('89-'90), Member of Committee for Electronics and Telecommunication of the Polish Academy of Sciences ('89-), Member of Presidential Board of Polish Committee for Optoelectronics ('90-), Dean of the Faculty of Electronics and Information Technology ('90-'96), Member of the Scientific Council of the Institute of Vacuum Technology ('91-'96), Member of the Advisory Board of the Ministry of Post and Communication ('92-'96), Member of the Advisory Board of the Ministry of Education ('93-), Chairman of the Science and Education Committee of the Union for Freedom Political Party ('94-'96), Member of the Program Council of Higher Education and Research, Institute of Public Affairs ('95-'99), Fellow of IEE ('95-), Governmental Expert of UNESCO ('96-'99), Rector of Warsaw University of Technology ('96-'02), Deputy-President of the Conference of the Rectors of Polish Academic Schools ('97-'99), Chairman of the Committee on Legislation of Science and Education ('97-'99), President of the Conference of the Rectors of Polish Universities of Technology ('97-'99), President of the Conference of the Rectors of Polish Academic Schools ('99-'02), Member of National Council for European Integration ('99-), Member of National Consultative Council for Reforms in Education ('99-), Member of Editorial Board of Higher Education in Europe – published by UNESCO ('99-), Member of International Fellow-Up Committee of UNESCO World Conference on Higher Education ('99-), President of Polish Rectors Foundation ('01-), Member of Council of European University Association ('99-'02), CRASP representative in the Council of EUA ('02-), Chairman of the Presidential Team in Charge of Elaboration of the Project of Law on Higher Education ('03-), Director of the Institute of Knowledge Society, ('03-), President of the Commission "Poland in United Europe" at Polish Academy of Sciences ('03-)

2.2. Junior Academic Staff

Name	Degree	Position	Phone number
Tomasz Bieniek	M.Sc.	Ph.D. Student	660-7534
Paweł Czuma	M.Sc.	Ph.D. Student	660-7246
Jarosław Dawidczyk	M.Sc.	Assistant, Ph.D. Student	660-7949
Emil Dusiński	M.Sc.	Ph.D. Student	660-7534
Tomasz Grudniewski	M.Sc.	Ph.D. Student	660-7981
Grzegorz Janczyk	M.Sc.	Assistant, Ph.D. Student	660-7207
Adam Jarosz	M.Sc.	Ph.D. Student	660-7207
Włodzimierz Jońca	M.Sc.	Ph.D. Student	660-7207
Marcin Kaczkan	M.Sc.	Ph.D. Student	660-5047
Małgorzata Kalisz	M.Sc.	Ph.D. Student	660-7534
Wojciech Kamiński	M.Sc.	Ph.D. Student	660-7778
Dominik Kasprowicz	M.Sc.	Ph.D. Student	660-7207
Andrzej Kociubiński	M.Sc.	Ph.D. Student	660-7534
Adam Kowalczyk	M.Sc.	Ph.D. Student	660-7207
Monika Kowalska	M.Sc.	Ph.D. Student	660-5047
Kamila Leśniewska-Matys	M.Sc.	Ph.D. Student	660-7772
Adam Linkowski	M.Sc.	Ph.D. Student	660-7907
Maung Than Htun Aung	M.Sc.	Ph.D. Student	660-7773
Robert Mroczyński	M.Sc.	Ph.D. Student	660-7773
Magdalena Nakielska	M.Sc.	Ph.D. Student	660-5047
Marek Niewiński	M.Sc.	Lecturer, Ph.D. Student	660-7781
Robert Paszkiewicz	M.Sc.	Ph.D. Student	660-7772
Paweł Popow	M.Sc.	Ph.D. Student	660-7693
Robert Rajkowski	M.Sc.	Ph.D. Student	660-7939
Mariusz Sochacki	M.Sc.	Ph.D. Student	660-7534
Artur Szczęsny	M.Sc.	Ph.D. Student	660-7534
Mateusz Śmietana	M.Sc.	Ph.D. Student	660-7534
Paweł Śniecikowski	M.Sc.	Ph.D. Student	660-7773
Paweł Wrzosek	M.Sc.	Ph.D. Student	660-7776
Agnieszka Zaręba	M.Sc.	Assistant	660-7773
Tomasz Zychowicz	M.Sc.	Ph.D. Student	660-7693
Jarosław Żelazko	M.Sc.	Ph.D. Student	660-7773

2.3. Technical and Administrative Staff

Name	Degree	Position	Phone number
Ryszard Biaduń		Senior Foreman	660-7851
Witold Ciemiewski		Senior Technician	660-7534
Kazimierz Dalbiak		Senior Technician	660-7534
Jerzy Domański	M.Sc.	Senior R&D Engineer	660-5419
Jerzy Gempel	M.Sc.	Senior R&D Engineer	660-7207
Marcin Grądzki	B.Sc.	Process Engineer	660-7782
Jan Gutowski		Supply Manager	660-7708
Irena Guzewicz-Śmiech		Secretary for Teaching	660-5349
Bożena Janus		Senior Clerk	660-7939
Stanisław Jeszka	M.Sc.	Senior R&D Engineer	660-7207
Piotr Karwański		Senior Foreman	660-5479
Krzysztof Krogulski		Senior Technician	660-7535
Marek Markiewicz		Senior Technician	660-7145
Artur Mikołajuk	M.Sc.	Technical Clerk	660-7782
Urszula Piotrkowicz		Accountant	660-7708
Jadwiga Radzyńska		Secretary	660-7777
Zbigniew Rudkowski		Senior Foreman	660-7908
Krystyna Szyłko		Senior Foreman	660-7851
Małgorzata Trzaskowska		Senior Technician	660-7534

3. TEACHING ACTIVITIES

3.1. Basic Courses

- [Edu1] **Application of Matlab in Calculation Methods** (Matlab w zastosowanych metodach obliczeniowych) **MZMO**, Mikołaj Baszun
- [Edu2] **Basics of Vacuum Technics** (Podstawy techniki próżni), **PTP**, Piotr Szwemin
- [Edu3] **Basics of Optics** (Podstawy Optyki), **POPT**, Jerzy Woźnicki
- [Edu4] **CAD for PCB (PADS)** (Wspomaganie komputerowe projektowania obwodów drukowanych), **PADS**, Ryszard Kisiel, Jerzy Kalenik
- [Edu5] **Characterisation of Microelectronic Structures and Technologies** (Charakteryzacja struktur i technologii mikroelektronicznych), **CSTM**, Bogdan Majkusiak
- [Edu6] **Characterisation of Solid State** (Metody badania ciała stałego), **BCS**, Piotr Szwemin
- [Edu7] **Computer Aided Design and Manufacturing of Microwave Circuits** (Komputerowe projektowanie i realizacja obwodów mikrofalowych), **KPROM**, Sławomir Palczewski
- [Edu8] **Design of audio system** (Konstrukcja aparatury audio), **KAA**, Zbigniew Pióro
- [Edu9] **Electronics 3** (Elektronika 3), **ELKA3**, Wiesław Kuźmich
- [Edu10] **Fields and waves**, (Pola i fale), **POFA**, Adam Abramowicz
- [Edu11] **Fundamentals of Microprocessor Techniques** (Podstawy techniki mikroprocesorowej), **TMIK**, Lidia Łukasiak
- [Edu12] **Fundamentals of Solid State Electronics** (Elektronika ciała stałego), **ELCS**, Jan Szmidt, Witold Pleskacz
- [Edu13] **Hardware Implementation of Algorithms in VLSI Circuits** (Sprzętowa implementacja algorytmów w układach VLSI), **SAV**, Elżbieta Piwowarska
- [Edu14] **High Frequency Techniques** (Podstawy techniki w.cz.), **TWCZ**, Bogdan Galwas
- [Edu15] **Hybrid Integrated Circuits Technology** (Technologia hybrydowych układów scalonych), **THUS**, Zbigniew Szczepański
- [Edu16] **Integrated Optoelectronics** (Optoelektronika zintegrowana), **OZT**, Michał Malinowski, Agnieszka Mossakowska-Wyszyńska
- [Edu17] **Introduction to the UNIX System** (Użytkowanie systemu UNIX), **USUX**, Andrzej Wielgus
- [Edu18] **Laser Applications** (Zastosowania laserów), **ZLA**, Jerzy Kęsik
- [Edu19] **Laser Engineering** (Technika laserów), **TL**, Faculty of Applied Physics and Mathematics WUT, Tadeusz Adamowicz
- [Edu20] **Laser Physics** (Fizyka laserów), **FLA**, Paweł Szczepański
- [Edu21] **Laser Physics 2** (Fizyka laserów 2), **FL2**, Paweł Szczepański
- [Edu22] **Logic Circuits** (Układy logiczne), **ULOGE**, Tadeusz Łuba
- [Edu23] **Materials, Elements and Design of Electronic Equipment** (Materiały, elementy i konstrukcje), **MEiK**, Ryszard Kisiel
- [Edu24] **Materials, Elements and Design of Electronic Equipment 2** (Materiały, elementy i konstrukcje2), **MEiK2**, Ryszard Kisiel
- [Edu25] **Methods and Algorithms for Design Automation of VLSI circuits** (Metody i algorytmy automatyzacji projektowania struktur scalonych), **MAPS**, Adam Wojtasik
- [Edu26] **Microelectronics Development Trends** (Kierunki rozwoju mikroelektroniki), **KRM**, Andrzej Jakubowski
- [Edu27] **Microwave and Lightwave Integrated Circuits** (Mikrofalowe i optofalowe układy scalone), **MOUS**, Jerzy Piotrowski
- [Edu28] **Models and Systems of Image Processing** (Modele i systemy przetwarzania obrazów), **MSPO**, Jerzy Woźnicki
- [Edu29] **Modern semiconductor memory** (Współczesne pamięci półprzewodnikowe), **WPP**, Andrzej Jakubowski, Sławomir Szostak
- [Edu30] **Noise Reduction in Electronics Systems** (Minimalizacja zakłóceń w aparaturze i systemach elektronicznych), **MZA**, Zdzisław Mączyński
- [Edu31] **Numerical Methods** (Metody numeryczne), **MNM**, Institute of Electronic Fundamentals WUT, Jerzy Krupka
- [Edu32] **Object Programming in Java** (Praktyka programowania obiektowego w Javie), **PPOJ**, Adam Wojtasik
- [Edu33] **Object Programming** (Programowanie obiektowe), **PROBI**, Adam Wojtasik
- [Edu34] **Object Programming Practice** (Praktyka programowania obiektowego), **PRM**, Michał Borecki
- [Edu35] **Operating Systems** (Systemy operacyjne), **SOE**, Andrzej Wielgus
- [Edu36] **Optowave Telecommunication** (Telekomunikacja optofalowa), **TEOP**, Bogdan Galwas
- [Edu37] **Optoelectronic elements and systems** (Elementy i systemy optoelektroniczne), **ESO**, Michał Malinowski
- [Edu38] **Photoelectric Phenomena in Semiconductors** (Zjawiska fotoelektryczne w półprzewodnikach), **ZFPP**, Stanisław Pietruszko
- [Edu39] **Photonics' Fundamentals** (Podstawy fotoniki), **FOT**, Michał Malinowski
- [Edu40] **Physical Fundamentals of Information Processing** (Fizyczne podstawy przetwarzania informacji), **FPPI**, Bogdan Majkusiak
- [Edu41] **Physics of Solid State** (Fizyka ciała stałego), **FCSR**, Jan Szmidt
- [Edu42] **Programming 8051 microcontroller** (Programowanie mikrokontrolera), **PMIK**, Lidia Łukasiak
- [Edu43] **Quality in Design and Manufacturing** (Jakość w procesach projektowania i wytwarzania), **JPPW**, Zdzisław Mączyński
- [Edu44] **Semiconductor Devices** (Przyrządy półprzewodnikowe), **PP**, Andrzej Jakubowski, Andrzej Pfiltner
- [Edu45] **Semiconductor Devices for Optoelectronics** (Półprzewodnikowe elementy optoelektroniczne), **PEO**, Paweł Szczepański
- [Edu46] **Silicon Thin Films** (Cienkie warstwy krzemowe), **CWK**, Stanisław Pietruszko
- [Edu47] **Surface Mounting Technology** (Technologia montażu powierzchniowego), **TMP**, Ryszard Kisiel
- [Edu48] **Technology of Integrated Circuits Fabrication** (Technologia monolitycznych układów scalonych), **TWMUS**, Romuald Beck
- [Edu49] **Thick film sensors** (Grubowarstwowe czujniki pomiarowe), **GCZP**, Zbigniew Szczepański
- [Edu50] **Thin Film Material Engineering** (Cienkowarstwowa inżynieria materiałowa), **CIM**, Jerzy Kruszewski

[Edu51] **VLSI Design in Standard Cell Style** (Projektowanie układów scalonych VLSI w stylu komórek standardowych), **PUVS**, Zbigniew Jaworski

3.2. Advanced Courses

- [Edu52] **Advanced Microelectronic and Optoelectronic Technologies** (Zaawansowane technologie mikroelektroniczne i optoelektroniczne), **ZTMO**, Romuald Beck
- [Edu53] **Advanced Physical Fundamentals of Optoelectronics** (Zaawansowane podstawy fizyczne optoelektroniki), **ZPFO**, Paweł Szczepański
- [Edu54] **Design of VLSI Circuits** (Projektowanie struktur scalonych VLSI), **PSSV**, Wiesław Kuźmich
- [Edu55] **Digital Image Processing** (Cyfrowe przetwarzanie obrazów), **CPOO**, Grzegorz Kukielka
- [Edu56] **Electronic and Photonic Devices for Telecommunication** (Przyrządy elektroniki i fotoniki dla telekomunikacji), **PEFT**, Bogdan Galwas
- [Edu57] **Integrated Optoelectronic Circuits and Optical Logic Circuits** (Zintegrowane układy optoelektroniczne i optyczne układy logiczne), **ZOUL**, Michał Malinowski
- [Edu58] **Optical Waveguide Lasers** (Wzmacniacze i lasery światłowodowe), **WLŚ**, Ryszard Piramidowicz
- [Edu59] **Optoelectronics Techniques of Information Processing** (Optoelektroniczne techniki przetwarzania informacji), **OTZI**, Janusz Parka, Jerzy Woźnicki
- [Edu60] **Physical Fundamentals of Nanoelectronics** (Podstawy fizyczne nanoelektroniki), **PFN**, Bogdan Majkusiak
- [Edu61] **Semiconductor Structures for VLSI and ULSI Circuits** (Struktury półprzewodnikowe dla układów VLSI i ULSI), **SPVU**, Andrzej Jakubowski

3.3. Courses in English

- [Edu62] **Electronics 1, EELE1**, Bogdan Majkusiak
- [Edu63] **Physics 3, A**, Bogdan Majkusiak
- [Edu64] **Quality Management, EQUMA**, Zdzisław Mączyński

4. RESEARCH PROJECTS

Project definition and description - prepared by Project Leaders.

4.1. Projects Granted by the University

- [Pro1] **The Development of Processing and Testing Methods of the Electronic Devices and Materials for Microelectronics and Optoelectronics** (Rozwój metod wytwarzania i badania materiałów i przyrządów w dziedzinie mikroelektroniki i optoelektroniki), project leader: Andrzej Pfiztner, May 2002 - May 2003, **sub-projects:**
- [Pro1.1] **Image and object parameters for visual information retrieval systems** (Wyszukiwanie parametrów obrazów i obiektów na obrazach dla potrzeb bazy danych fotografii cyfrowej), sub-project leader: Grzegorz Kukielka
The human perception mechanism is equipped with an amazing system for recognising an infinite number of shapes, colours, patterns, textures, object and backgrounds. The mechanics of such capabilities are of course not fully understood. A visual document has similar ingredients of the human environment i.e.; it has features such colour, line, region, corners and textures. A full functional retrieval system provides means to store, organise, add and delete images and search those images by content. In our system the indexed visual image features are used in query interfacing. The typical visual features are local and global colour, texture and sketch. One major task of our project is visual features space development and optimisation.
- [Pro1.2] **The implementation of the distributed Monte-Carlo computation scheme to determination of the gas state parameters in the metrological systems** (Obliczenia rozproszone w zastosowaniu do wyznaczania parametrów układów metrologicznych metodą Monte-Carlo), sub-project leader: Piotr Szwemin, co-worker: Marek Niewiński
The dynamic expansion systems are generally used for generation of calibration pressures in the high and ultra high vacuum range. The uncertainty of the generated pressure can be evaluated by means of a computer simulation. In such a case, the MC method is limited by a very long time of computation. To omit this disadvantage, the distributed calculation model has been implemented in the form of a computing environment. It consists of three applications: *Moly_Flow..er_Editor*, *Moly_Flow..er_Server* and *Moly_Flow..er_Console*. The first application is used to create the description of the calibration system's geometry. The *Moly_Server* is working as a service on PC computers and waiting for simulation tasks to be performed. The *Moly_Console* defines, starts and finishes simulation projects. The project is defined by: the geometry description of the system, collection of computers with running *Moly_Server* service, and parameters to be evaluated.
- [Pro1.3] **The method development for projecting optoelectronics and photonics microsystem** (Rozwój metod projektowania konstrukcji i badania mikrosystemów optoelektronicznych oraz fotowoltaicznych), sub-project leader: Jerzy Kruszewski, co-workers: Michał Borecki, Maria Bełłowska, Stanisław Pietruszko, Zbigniew Szczepański
The new methods for projecting optoelectronics and photonics micro system are forced by technological progress. The optoelectronics micro systems realisations in MOEMS technology and on the second hand incorporate PMMA optical fibre grows rapidly. These are the new technology, so the new methods incorporate computer models are under investigation. The components of photonics systems are in on market state. Therefore, the research of their reliability and application are taken.
- [Pro1.4] **Nanoelectronic test structures** (Struktury testowe dla nanoelektroniki), sub-project leader: Romuald B. Beck, co-workers: Andrzej Jakubowski, Bogdan Majkusiak, Jan Szmidt, Aleksander Werbowy, Lidia Łukasiak, Sławomir Szostak, Jan Gibki, Agnieszka Zaręba, Jakub Walczak, Witold Ciemiewski, Kazimierz Dalbiak, Małgorzata Trzaskowska
The project aims at review of effects, devices, technologies and characterisation methods that can be practically implemented into fabrication in technological lab. of Institute of Microelectronics and Optoelectronics, Warsaw University of Technology.
- [Pro1.5] **Operating conditions analysis of the transistor oscillator coupled with the photovaractor** (Analiza warunków pracy oscylatora tranzystorowego sprzężonego z fotowaraktorem), sub-project leader: Bogdan Galwas, co-workers: Jerzy Piotrowski, Jerzy Skulski, Jarosław Dawidczyk, Bożena Janus
The aim of the work is analysis of operating conditions, design and measurements of the microwave transistor oscillator, which is optically controlled by using indirect method. The indirect method uses Optically Variable Capacitor, i.e., device that contains microwave varactor controlled by photodiode. This method allows optical control of microwave generator frequency.
- [Pro1.6] **New and improved methods of simulation od manufacturing processes in microelectronics and modeling of IC devices** (Nowe i ulepszone metody symulacji procesów produkcyjnych mikroelektroniki i elemntów układów scalonych), sub-project leader: Wiesław Kuźmich, co-workers: Zbigniew Jaworski, Andrzej Pfiztner, Adam Wojtasik, Elżbieta Piwowarska,
The goal of this work is to improve existing models or develop new ones for simulation of manufacturing processes in microelectronics and for device modeling. These models will be implemented in our CAD software extending its capabilities toward deep submicron CMOS processes. In particular, the following topics will be included: simulation of very shallow ion implanatation, simulation of rapid thermal annealing, simulation of deposition and doping of polysilicon, 2D and simplified

3D simulation of MOS devices, new MOS device models (BSIM4, EKV).

- [Pro1.7] **Measurements of the complex permittivity of single crystal oxides and software development for automation of measurement of insertion loss vs. frequency dependence for SAW delay lines** (Badania zespolonej przenikalności elektrycznej monokryształów tlenkowych oraz opracowanie oprogramowania do automatycznych pomiarów charakterystyk częstotliwości linii opóźniających APF), sub-project leader: Jerzy Krupka, co-worker: mikołaj Baszun
 The objective of the first part of this work is joint research on measurements of the complex permittivity of new dielectric materials at microwave frequencies and cryogenic temperatures under polish-australian linkage grant entitled: INVESTIGATIONS AND CHARACTERIZATION OF NEW MATERIALS FOR WIRELESS COMMUNICATIONS. Goals of this work will be elaboration of measurement techniques including electromagnetic fields analysis, optimisation of measurement fixtures and manufacturing of test samples. The second part of the work is connected with surface acoustic wave delay lines and is aimed to software development for automation of insertion loss vs. frequency measurements. Control of the measurement processes are realized with using of specialized computer interface card. Software is designed with using of C language environment.
- [Pro1.8] **Modelling and investigation of waveguide laser structures** (Modelowanie i badanie światłowodowych struktur laserowych), sub-project leader: Michał Malinowski
 Waveguide, active structures based on rare-earth doped fibers, planar structures or microdisk and spherical waveguides offer an attractive technology for micro-size lasers. One of the recent important developments is the successful operation of fiber lasers, which offer the highest efficiencies and the best thermal working conditions among solid-state lasers. Fiber lasers not only could be easily coupled to optical telecommunication fiber components, but also give output powers exceeding kW cw range. In this work we present a general modelling of Nd-doped fiber, planar and micro-disc laser. Approximate analytical results are derived for the threshold and the output intensities. Experimental work is oriented on the investigation of fiber lasers based on Pr, Ho and Nd ZBLAN glass, and micro-sphere crystalline YAG structures.
- [Pro2] **The Development of Design, Processing and Testing Methods of the Electronic Devices and Materials for Microelectronics and Optoelectronics** (Rozwój metod projektowania oraz metod wytwarzania i badania materiałów i przyrządów w dziedzinie mikroelektroniki i optoelektroniki), project leader: Andrzej Pfitzner, August 2003 - March 2004, sub-projects:
- [Pro2.1] **Modelling and investigation of planar waveguide lasers** (Modelowanie i badanie planarnych struktur laserowych), sub-project leader: Michał Malinowski
 Diode-pumped, solid-state lasers have a wide variety of applications in the industrial, military, medical, and research sectors. Here we discuss the use of a planar waveguide lasing geometry, which is well matched to that of a diode bar reducing or eliminating the need for beam shaping. In this work a general modeling of Nd and Yb -doped planar lasers is presented. Approximate analytical results are derived for the threshold and the output intensities. Experimental work is oriented on the technology and investigation of Nd, Yb and Pr activated YAG planar waveguides and micro-
- [Pro2.2] **The development of software tools for designing process simulation of microwave amplifiers** (Opracowanie narzędzi symulacji procesu projektowania wzmacniaczy mikrofalowych), sub-project leader: Bogdan Galwas, co-workers: Jarosław Dawidczyk, Jerzy Skulski, R. Wojtyra
 The goal of this project is application of Java programming tools for designing of simple, one-transistor microwave amplifiers. Main work tasks are connected with the following topics: development of software for drawing characteristics on Smith's, chart and polar chart, development of software for calculation, of gain and impedance matching in unilateral model of the amplifier, development of software user's manual.
- [Pro2.3] **Manufacturing and characterisation of ultrathin gate dielectric SiOxNy layers for future CMOS-ULSI applications** (Wytwarzanie i charakteryzacja struktur z ultracienką warstwą SiOxNy jako dielektrykiem bramkowym dla przyszłych generacji układów CMOS-ULSI), sub-project leader: Romuald B. Beck, co-workers: Andrzej Jakubowski, Bogdan Majkusiak, Jan Szmidt, Aleksander Werbowy, Lidia Łukasiak, Sławomir Szostak, Witold Ciemiewski, Kazimierz Dalbiak, Małgorzata Trzaskowska and students.
 The aim of this project is tuning the PECVD process to allow deposition of ultrathin silicon oxynitride layers (SiOxNy) the quality of which would allow their application in CMOS-ULSI technology as gate dielectrics. The properties of the formed layers are investigated by means of ellipsometric spectroscopy, XPS, as well as by analysis of electrical characteristics (applying specially designed test structure and technology).
- [Pro2.4] **Properties of the high vacuum standards** (Badanie właściwości systemów metrologicznych wysokich próżni), sub-project leader: Piotr Szemin
 The accuracy of the vacuum standards depends among others on the gas flux distribution in the calibration and pumping chambers. Because of the poor accuracy of vacuum gauges comparing to the level of irregularity of the flux, this effect can not be measured and can be only estimated by the use of computer simulation. The main aim of this work was to determine the influence of gas flux distribution on the generated pressure. The calculations were made IMGC vacuum standard. The gas flux distribution irregularity expressed as correction factors at the location of gauge ports are: in the calibration chamber 2×10^{-4} , in the pumping chamber 5×10^{-4} . The second aim of this work was to estimate the limits of Monte-Carlo simulation

- implementation connected with floating point arithmetic. The carried out tests show that this MC method simulation can give results with the accuracy of the 10^{-6} .
- [Pro2.5] **Development of a standard cell library for deep submicron CMOS technologies** (Opracowanie biblioteki komórek logicznych dla technologii submikronowych CMOS), sub-project leader: Wiesław Kuźmich, co-workers: Elżbieta Piwowarska, Witold Pleskacz, Zbigniew Jaworski, Andrzej Wielgus and students
The goal of this project is to develop a library of standard cells for at least one of deep submicron CMOS technologies available in European silicon foundries. Although foundries make their libraries available for IC designers, full layouts of the cells are not disclosed. This is sufficient for routine design of digital ICs but not for research work. Our own library will allow to study layout-related effects on the performance and manufacturability of IC designs.
- [Pro2.6] **The design and technology of optoelectrical and hybrid circuit development** (Rozwój metod projektowania i technologii układów optoelektronicznych i hybrydowych), sub-project leader: Michał Borecki, co-workers: Jerzy Kruszewski, Paweł Wrzosek
The topic consist of three parts. First part involve the investigation of electrical mini connections which were made in Pb free technology with small amount of Ag. Second part concern the micro-opto-mechanical vibration sensor construction. The main aim of this section is investigation of optical fiber mounting and positioning in silicon substrate technology. The last part involve characterization of photovoltaic systems' measurement method.
- [Pro2.7] **2D-object feature specific measurements** (Parametryzacja i wymiarowanie obiektów 2D), sub-project leader: Jerzy Woźnicki
Measurements that can be performed on each of the individual features of objects in images can be grouped into four classes: brightness (including color values), location (both absolute position and relative to other features present), size and shape. For each class quite a variety of different specific measurements can be made and there are a variety of different ways to perform the operations. Most image analysis systems offer to deal with several different measurement parameters. The problem is frequently to decide which of the measured parameters is most useful or appropriate for solving a particular problem.
We have developed experimental system for tests of different object representation features in form of 2D primitives. These primitives are multi-modal local descriptors that carry information about visual aspects such as orientation, contrast transition and color in a condensed way.
- [Pro2.8] **Characterization of single crystal dielectric oxides and microwave ferrites** (Badania zespolonej przenikalności elektrycznej monokryształów tlenkowych oraz wybranych magnetycznych właściwości ferrytów mikrofalowych), sub-project leader: Jerzy Krupka
Main goal of this work is to characterize electromagnetic properties of different single-crystal materials at microwave frequencies from room to liquid helium temperatures and measurements of the complex permeability of microwave ferrites. Since single crystal materials are usually expensive, we plan to measure them by two different techniques. The first technique will be the dielectric rod resonator technique operating on TE_{011} and HE_{111} modes for all possible materials. This measurement technique requires small samples and it is relatively fast and cost effective. The second technique will be whispering gallery mode (WGM) technique that will be used for to measure the lowest loss materials. This work is partially supported by Australian Research Council Under Polish-Australian INVESTIGATIONS AND CHARACTERIZATION OF NEW MATERIALS FOR WIRELESS COMMUNICATIONS.
- [Pro3] **Development of a microscopic image analysis system for medical images** (Integracja systemu do analizy obrazów mikroskopowych), project leader: Hanna Górkiewicz-Galwas, June 2002-May 2003
Video and digital computation technologies have contributed in a major way to the recent renaissance of light microscopy. It was the aim of this project to build an application of the computer-assisted image analysis, as an example for the use of video-microscopy in biomedicine. By coupling a CCD-based video camera to a microscope, and storing the recorded images to computer hard disk via a frame-grabber, the basic unit for a microscopic image analysis system can be set up at an affordable price. For processing and analysis of digitised images, several software packages are available at the market, covering a wide spectrum in price and functionality. The first and usually the most difficult stage in a biomedical image processing system is the object isolation. A variety of automated and semiautomatic methods have been implemented in our work to perform this task, representing a major improvement in comparison to older manual methods.
- [Pro4] **Elaboration of the methodology of characterisation of PV systems** (Charakteryzacja metod pomiarowych stosowanych w badaniach systemów fotowoltaicznych) project leader: Stanisław M. Pietruszko, July 2002 – June 2003
Elaboration of methodology for gathering measurement data in Data Acquisition Systems dedicated for PV systems, as well as introducing new procedures for data analysis.
- [Pro5] **Investigating of the influence of small hydrogen content on the transport parameters of charge carriers in amorphous silicon** (Badanie wpływu małych zawartości wodoru na parametry transportu krzemu amorficznego), project leader: Stanisław M. Pietruszko, December 2002 – June 2003
Investigating of the influence of small hydrogen content (0,05 - 1 at.%) on the transport parameters (conductivity, activation energy, etc.) of charge carriers in amorphous silicon.

- [Pro6] **Investigation of planar waveguide Yb³⁺:YAG/YAG laser** (Opracowanie i zbadanie planarnego lasera światłowodowego Yb³⁺:YAG/YAG), project leader: Michał Malinowski, June 2002 – May 2003
Diode-pumped, solid-state lasers have a wide variety of applications in the industrial, military, medical, and research sectors. Here we discuss the use of a planar waveguide lasing geometry, which is well matched to that of a diode bar reducing or eliminating the need for beam shaping. Recently, much attention has been focused on Yb-doped solid-state lasers and Yb-doped materials due both to the favourable functions of Yb ions in many kinds of laser host material and to the recent advances in high power laser diode pumping sources. Access to liquid phase epitaxy allows us fabrication of Yb:YAG waveguides on YAG substrates with low propagation losses. Theoretical works and experimental studies on Yb:YAG/YAG planar waveguide lasers are developed.
- [Pro7] **Measuring system of liquid viscosity with using of piezoceramic ultrasonic transducers** (System pomiarowy lepkości cieczy z wykorzystaniem piezoceramicznych przetworników ultradźwiękowych) project leader: Jerzy Krupka, co-workers: Mikołaj Baszun, Jerzy Rudkowski, Mariusz Mróz, Paweł Popow, June 2002-May 2003
The work obey:
Analysis, design and experimental testing of an electronic system for liquid viscosity measuring system. The measuring process is based on ultrasonic wave velocity dependence on liquid viscosities.
- [Pro8] **Modelling and investigation of physical phenomena in low-dimensional nanoelectronic MOS and MOS SOI structures** (Modelowanie i badanie zjawisk fizycznych w nanoelektronicznych strukturach niskowymiarowych MOS i MOS SOI) project leader: Bogdan Majkusiak, co-workers: J. Walczak, Andrzej Jakubowski, Romuald B. Beck, Jan Szmidt, Aleksander Werbowy, Lidia Łukasiak, Sławomir Szostak, Jan Gibki, Agnieszka Zareba, Jakub Walczak, Witold Ciemiewski, Kazimierz Dalbiak, Małgorzata Trzaskowska, June 2002 – May 2003
The project is devoted to modelling of quantum-mechanical phenomena in low-dimensional structures based on the MOS system. The density of electron charge in the channel of MOS or MOS SOI structures is investigated as a function of the channel thickness and the gate oxide thickness.
- [Pro9] **Researches on stability and long-life performance of metal ion UV laser generation in noble gas – copper halide mixtures** (Badania nad zwiększaniem stabilności generacji i długowieczności ultrafioletowego lasera jonowego na mieszaninie neonu i halidków metali), project leader: Tadeusz M. Adamowicz, June 2002 – May 2003
Spectral emission on Cu II UV levels in 248-270 nm range as well laser oscillations on UV and IR Cu II transitions in He/Ne – copper halide mixtures are investigated. Special systems based on the cathaphoresis effect and thermal shields are used to prevent contamination of optical parts of the laser tubes. The efficiency the systems was tested by measuring the long-time stability of the laser and spectral emission intensities.
- [Pro10] **Studies on monitoring procedures of autonomous PV systems** (Opracowanie procedur monitorowania autonomicznych systemów fotowoltaicznych), project leader: Stanisław M. Pietruszko, July 2002 – June 2003
Project and installation of electronic data acquisition systems. Studies on procedures of computer aided data analysis as well as introducing guidelines for designing and installing stand-alone PV systems.
- [Pro11] **The analyse of high vacuum standards properties based on “global” system model** (Wyznaczanie parametrów stanu gazu w układzie wzorca próżni z dynamiczną ekspansją gazu, w oparciu o koncepcję globalnego współczynnika korekcyjnego), project leader: Piotr Szwemin, co-worker: Marek Niewiński, June 2002-May 2003
The work is concentrated on the gas flow modelling in high vacuum standards with the dynamic expansion of gases. The weakness of traditional model, which bases on the electrical circuit's analogy, has motivated the author to elaborate a new, global model. The macroscopic parameters as the gas number density and the gas flux density in the local volumes of the calibration chamber are evaluate on the base of the molecules behaviour in microscopic scale of this model. The molecules are traced in the whole space of the high vacuum standard. Its inner surfaces are described by the mathematics equations as close as possible as well as the gas molecules interactions are also described by experimentally well confirmed scattering law. Using this model it is possible to study even the influence of mutual relations between the system elements. By this way it will be also possible to find the source of systematic differences between the particular high vacuum standards.
- [Pro12] **Investigations of photorefractive properties o liquid crystal cells and their applications for dynamic holography** (Badanie właściwości fotorefrakcyjnych przetworników ciekłokrystalicznych i ich zastosowanie w holografii dynamicznej), project leader: Janusz Parka, co-worker: Tomasz Grudniewski, June 2003-December 2003
The aim of the project is improvement of dynamic holographic gratings in thin cells liquid crystal with high photorefractive index ($\Delta n > 0.4$) doped by photosensitive admixtures. For writing and erasing times of holographic gratings is volume conductivity of the liquid crystal and “charge-transfer” complexes between molecules of liquid crystal. Mechanisms of these processes are studied.
- [Pro13] **Nanocrystalline boron nitride (BN) films for microelectronic applications – deposition and characterization** (Warstwy nanokrystalicznego azotku boru (BN) dla aplikacji mikroelektronicznych - wytwarzanie i charakteryzacja); project leader: Aleksander Werbowy, co-workers: P. Firek, M. Gałązka, M. Wiatroszak, R. Łukasiewicz, W. Ciemiewski, K. Dalbiak, M.

Trzaskowska.. June 2003 - December 2003

MIS capacitor structures with boron nitride insulating films grown by means of RPP CVD process (using two different boron sources: BH_3NH_3 and $(\text{C}_2\text{H}_5)_3\text{B}$) were produced and investigated. Their current-voltage (I-V) and capacitance-voltage (C-V) characteristics were measured within the temperature range from 25°C up to 300°C , and then analyzed. Better properties demonstrated structures with BN layers obtained from $(\text{C}_2\text{H}_5)_3\text{B}$, in particular when they were subject of the low temperature annealing process.

- [Pro14] **Plasma assisted etching (RIE) of dielectric films for application in advanced microelectronic and nanoelectronic technologies** (Trawienia wspomagane plazmą (RIE) warstw dielektrycznych na potrzeby zaawansowanych technologii mikroelektronicznych i nanoelektronicznych), project leader: Jan Szmids, co-workers: R. Mroczynski, M. Galazka, J. Zelazko, K. Klimczak, W. Ciemiewski, K. Dalbiak, M. Trzaskowska. June 2003 - December 2003

The aim of the project was investigating of the process parameters of RF plasma assisted etching of metal oxides (Al_2O_3 , Ta_xO_y , TiO_x) meant for applying in advanced microelectronic and nanoelectronic technologies. The influence of the principal parameters of the etching process (power of the RF generator, pressure, gas flow rate) on the substrate material as well as metallic mask was analyzed and determined. Simple microelectronic structures (MIS capacitors, MIS field effect transistors) with metal oxide gate insulators were produced and investigated.

- [Pro15] **Analysis of working conditions and investigation of dielectric micro-shere and micro-ring lasers** (Analiza warunków pracy i badanie dielektrycznych laserów z mikrorezonatorami o symetrii sferycznej), project leader: Michał Malinowski, July 2003 – December 2003

Microdisk and spherical waveguides, resonators, and lasers are important optoelectronic devices because of the possibility of their implementation as compact and efficient passive or active devices, based on their high Q circular structure. Particularly microdisk lasers have low threshold and the low-order transverse-electric mode are dominant. Experimental results revealed a possibility of a narrow-band single-mode lasing and a high spontaneous emission coupling strength.

In the program we perform a systematic study of the nonlinear operation of microdisk lasers. On the basis of the energy conservation theorem we derive an approximate formula which relates the small signal gain in the active medium to the output power and real parameters of the laser structure. In particular, the laser characteristics obtained for whispering-gallery modes and radial modes reveal the behavior of the optimal outcoupling coefficient (which provides maximal power efficiency) as a function of the structure parameters.

- [Pro16] **Plasma deposited nanocrystalline boron nitride (BN) films for microelectronics – synthesis, characterization and applications** (Plazmowo wytwarzane warstwy nanokrystalicznego azotku boru (BN) dla zastosowań elektronicznych – synteza, charakteryzacja i aplikacje); project leader: Aleksander Werbowy, co-workers: Andrzej Jakubowski, Bogdan Majkusiak, Jan Szmids, Lidia Łukasiak, Sławomir Szostak, Witold Ciemiewski, Kazimierz Dalbiak, Małgorzata Trzaskowska and students, July 2003 – December 2003

Fabrication technology of silicon MISFET transistor with plasma grown (RPP CVD process) nanocrystalline boron nitride film playing the role of gate insulator was developed. One of its crucial elements was elaboration of the process of selective etching of BN. Electronic properties of Al contacts to Si surface exposed in the course of plasma etching of previously grown BN layer were investigated. Chemical sensitivity of structures with boron nitride to certain organic compounds was demonstrated.

- [Pro17] **The analyse of dynamic vacuum standards properties based on “global” system model** (Analiza i porównanie wzorców wysokich próżni w oparciu o model globalny), project leader: Piotr Szewmin, October 2003 – December 2003

The continuous expansion of gas is a technique widely used in pressure standards. Traditionally, the number density of the gas, n in the calibration chamber, is calculated from the formula which contains three essential factors the flow rate, the conductance and the factor that accounts the backstream effect from the pumping chamber into the calibration chamber. This factor can be measured on the base of the gas density ratio or calculated by means of Monte-Carlo simulation. Comparison of measurement and MC computation can give us the information about the accuracy of the model of the surface-gas indirection used in calculation. Such a comparison was made for standard located in IMG C in Italy (Torino). The results obtained by two methods are in agreement within the 2×10^{-3} . From this fact, we can conclude that the assumption of cosine law (which describes the scattering process) is reasonable and does not introduce the uncertainty greater than 2×10^{-3} when the typical calibration system is analyzed.

- [Pro18] **Attempt to use multivalued mathematical morphology for the assessment of tumour-induced angiogenesis on an animal model** (Analiza procesu angiogenezy przy wykorzystaniu wielowartościowych metod morfologicznych), project leader: Grzegorz Kukielka, October 2003 – December 2003

Angiogenesis is the formation of new blood vessels. We aimed our study to assess the effects of various stimuli on the development of new blood vessels using the digital image processing system based on mathematical morphology methods. The purpose of using image segmentation for the evaluation of the test was to introduce automatic quantification with a simultaneous definition of the surface, shape and size of new blood vessels.

We describe the first step of our studies, which concerns the ability of spatial image segmentation of microscopic image to a form of known number of regions representing blood vessels differentiated from the background.

We consider the problem of image segmentation as the general image processing task. Based on the multidimensional morphological filter theory a universal segmentation algorithm is developed. We also present the results of the described

segmentation method on several examples containing grayscale images of different objects. Using a set theoretical methodology for image analysis, mathematical morphology can estimate many features of the geometrical structure in the image such as size, connectivity, shape, and others. This corresponds with nature of human visual system. For this reason we use mathematical morphology methods to solve the image segmentation problem.

Being independent of any specific application, this mathematical morphology segmentation method can be used in many fields. The described segmentation method does not destroy the contours of the extracted regions because of the properties of morphological filters used during simplification phase of the algorithm. Because all morphological filters and operators are based on very simple operations so can be easy implemented both in software and hardware. We are used Khoros image processing system during implementation phase of the algorithm.

- [Pro19] **Analysis of working conditions and investigation of fiber laser structure for visible wavelengths** (Badanie i modelowanie warunków wzbudzenia promieniowania krótkofalowego we włóknowych laserach światłowodowych), project leader: Michał Malinowski, October 2003 – December 2003

Currently there is interest in developing compact, short wavelength, all solid state laser sources for display, data storage and material processing applications. One of the promising approach is to use upconversion pumping schemes leading to laser action at wavelength shorter than that of pump radiation. The program is focused on studying upconversion phenomena in trivalent praseodymium rare-earth doped fiber lasers. The significant interest in studying Ho^{3+} , Pr^{3+} and Nd^{3+} materials results from the energy spectrum of these ions containing several metastable multiplets offering possibility of simultaneous laser emission at various wavelengths from ultraviolet to infrared.

- [Pro20] **Methods of testing of low frequency relaxation properties of bio-materials in liquid solutions** (Analiza metod badania niskoczęstotliwościowych właściwości relaksacyjnych biomateriałów w roztworach), project leader: Jerzy Krupka, October 2003 – December 2003

Problems with the Low Frequency Dielectric Spectroscopy (LFDS) of liquids containing biomolecules, occurs mainly due to the fact of the relatively high conductivity of those solutions and the formation of the double layer on the metal electrodes. Double layers change, in a non-controlled, manner the distribution of the electric field within the sample making extremely difficult the unambiguous interpretation of impedance measurements in terms of sample parameters. The analysis of possible ways to minimize the measurement problems has been shown. Directives for design of the measurement cell and measurement system were developed

- [Pro21] **Modeling of PIN photodetectors nonlinear parameters** (Modelowanie nieliniowych parametrów fotodetektorów PIN), project leader: Bogdan Galwas, co-worker: Jarosław Dawidczyk, October 2003 – December 2003

The goal of this project is to develop the PIN photodiode nonlinear model with nonlinear photodetection process. Main work tasks are connected with the following topics:

- development of proper linear measurements of the device,
- development of the device nonlinear model parameters extraction method,
- development of functions describing voltage and optical power level dependencies of device model parameters.

- [Pro22] **Semi-classical theory of operation of CG-DBR/DFB laser with saturable absorber** (Półklasyczna teoria generacji promieniowania w laserze CG-DBR/DFB z dodatkowym obszarem nieliniowego absorbera), project leader: Paweł Szczepański, October 2003 – December 2003

In this paper, the model of light generation in CG-DBR/DFB was presented. The considered structure has the additional section with saturable losses, which able to obtain the bistable operation.

Our approach is based on the semi-classical theory, in which the electric field is described with the help of general Maxwell's equations, and radiation-matter interaction is considered on the quantum mechanical background.

The set of self-consistency equations, describing the space distribution and time evolution of laser field complex amplitudes, were derived.

- [Pro23] **The fiber optic intensity systems modeling simulation and design with computer aid** (Metody inżynierii komputerowej w modelowaniu, symulacji i projektowaniu nateżeniowych systemów światłowodowych), project leader: Michał Borecki, co-workers: Jerzy Kruszewski, Paweł Wrzosek, October 2003 – December 2003

This grant consist of two parts. the first part theme is the optical signal losses in real polymer fiber transmission lines and second is optical active fiber parameters identification.

First part concerns polymer fibers' which characterize a large core diameter, large numerical aperture, large losses and large elasticity. The large elasticity consequence is possibility of fiber putting down in skirting-board. The skirting-board width is down to 1cm, and its path has many corners that mean that fiber has many bends with curvature radius about 1cm. The power losses in fiber bend can be estimated on fiber core radius to curvature radius ratio. Therefore, this type of optical signal losses is greater in polymer fiber paths than in glass ones. This paper presents the new method of optical losses in real polymer fiber transmission lines mathematical modeling. The experiment shows that in standard polymer fiber lay down the geometrical and material optical losses have similar values. The elaborated method is correct.

Second part authenticate erbium doped fiber as optical amplifier basic element. The estimation of fiber parameters set is the main problem of projecting its application. The fiber core radius, the overlap factors representing the fraction of pump power and signal within the doped region, doping concentration and fiber glass type are necessary for this task. The problem is significant, because fiber producers do not print full data or the printed data do not agree with facts. The presented solution is

their identification with typical printed and measured data using in mathematical model of quantum and wave optics. The elaborated method was done on 3M active fiber samples with effects show that its correctness is about 15%.

[Pro24] **Modeling of MOS SOI transistors** (Modelowanie tranzystorów MOS SOI), project leader: Wiesław Kuźmicz, co-worker: Grzegorz Janczyk, October 2003 – December 2003

The SSOI-MOS (Sectional SOI-MOS) -? new DC model of SOI-MOS transistors has been elaborated and tested and successively compared with experiment. The model is based on the local channel and substrate analysis of important physical phenomena, which affect the SOI-MOS transistors behaviour. It considers many aspects of the real physical phenomena present inside the body. Along with the theoretical algorithms, the software implementation of the model has been done. It is a major part of Grzegorz Janczyk dissertation thesis.

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

[Pro25] **Novel dielectric layers for silicon carbide preserving their properties at elevated temperatures** (Nowe dielektryczne warstwy na węglu krzemu zachowujące swoje właściwości w podwyższonych temperaturach), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jan Szmidt, co-workers: Aleksander Werbowy, Andrzej Jakubowski, Romuald B. Beck, Bogdan Majkusiak, Lidia Łukasiak, Jan Szmidt, Agnieszka Zaręba, Józef Maciak, Antoni Siennicki, Aleksandra Sokołowska, Mietek Bąkowski, Piotr Niedzielski, October 2000 - September 2003

The aim of the project is to investigate various dielectric layers on SiC and Si substrates at elevated temperatures (up to 500°C). These are films of nitrides (AlN, BN) and oxides (Al₂O₃, TiO₂, Ta₂O₅).

[Pro26] **Silicon-germanium (SiGe) – material for new generation CMO devices** (Krzemogerman (SiGe) – materiał dla przyrządów CMOS następnej generacji), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Małgorzata Jurczak, co-workers: Andrzej Jakubowski, Jan Szmidt, Romuald B. Beck, Bogdan Majkusiak, Lidia Łukasiak, Agnieszka Zaręba, Antoni Siennicki, Aleksander Werbowy, Tomasz Dębski, Sławomir Szostak, Jan Gibki, Jakub Walczak October 2000 - September 2003

Silicon-germanium significantly improves the speed of operation of both MOS and bipolar devices. The aim of the project is to develop a mathematical description of basic devices of contemporary CMOS and BiCMOS circuits (MOSFEET, HBT and MOSCAP) fabricated using the Si/SiGe heterostructure. The developed models will enable device optimization (e.g. profile and concentration of Ge in the SiGe base or channel). These models will also become the basis for extensive characterization of these devices, mainly through the analysis of I-V and C-V characteristics.

[Pro27] **Ultrathin SiO₂ and high-K dielectric layers for next generation ICs** (Ultracienkie warstwy SiO₂ oraz dielektryki o wysokiej przenikalności elektrycznej dla układów scalonych nowej generacji), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Andrzej Jakubowski, co-workers: Romuald B. Beck, Bogdan Majkusiak, Lidia Łukasiak, Jan Szmidt, Agnieszka Zaręba, Józef Maciak, Andrzej Wojtkiewicz, Krzysztof Domański, Sławomir Szostak, Jan Gibki, Jakub Walczak, Michał Korwin-Pawłowski, Jerzy Rużyło, October 2000 - September 2003

The ITRFS roadmap points out clearly that the required for next few MOS-ICs gate SiO₂ thickness will fall as low as to the few monolayers only. Formation of such extremely thin layers in a controllable and repeatable way is enormous challenge for silicon technology. The work will address few critical problems, namely: design of appropriate test structures, analysis of high-K dielectrics potentially suitable for the gate stack, investigation of beginning stages of oxidation and nitridation, theoretical models of C-V behaviour and charge pumping allowing determination of the studies layers quality, development of the ultrathin layers technology (single layers) and double (ultrathin +additional – high-K). Part of the study is performed in collaboration with X-ion (company located in France), which aims to develop a novel technology of ultrathin layers formation.

[Pro28] **Optimization of construction and technology of ion argon laser discharge tube** (Optymalizacja konstrukcji i technologii wykonania ceramiczno-metalowej rury wyładowczej jonowego lasera argonowego), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jerzy Kęsik, February 2001 – December 2003

The main aim of the project is to construct ion laser tube with quasi-continuous SiC discharge capillary. The silicon carbide has good vacuum properties, high thermal conductivity and high resistance on ion sputtering effect. The anticipated effect of this construction is decreasing of gas pumping phenomena and increasing of laser output power. The additional application of permanent ring magnets should also substantially enhance the output power.

[Pro29] **New active planar photonic band-gap structures** (Nowe aktywne struktury planarne z foniczne przerwą zabronioną), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Paweł Szczepański, co-workers: Agnieszka Mossakowska-Wyszyńska, Anna Tyszcza-Zawadzka, Robert Paszkiewicz, Michał Malinowski, Ryszard Piramidowicz, Andrzej Jakubowski, February 2001 – June 2003

The purpose of this project is the investigation of the new active materials based on photonic band gap structures. Particularly, modelling of the light generation in planar photonic band-gap waveguide laser structures and planar waveguide laser structures having photonic band-gap active medium is performed. The effects of the structure parameters on the threshold gain, output power and coherence of the generated light are considered for various types of the laser cavities (e.g. F-P, DFB, DBR etc.).

The analysis of the possible technologies suitable for the manufacturing of active photonic band-gap crystals and active photonic band-gap planar waveguide structure is carried out.

- [Pro30] **Tunable filters based on dielectric resonators TUF** (Przestrjalne filtry oparte na rezonatorach dielektrycznych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jerzy Krupka, April 2002 – March 2004
 TUF will focus on novel approaches for frequency tuning of dielectric resonators based filters. The project has the following technical objective:
 - To provide a tunable dielectric filter capable of satisfying 3 rd, 4 th Generation and satellite requirements.
 - To apply tunable dielectric technology to nano-scale detectors.
 - To search for new materials and approaches in electronic tuning of dielectric resonators.
- [Pro31] **PV-EC-NET - Network for Co-ordination of European and National RTD Programmes for Photovoltaic Solar Energy** (Zespół do Koordynacji Europejskiego i Krajowych (Krajów UE) Programów Rozwoju Fotowoltaicznej Energii Słonecznej SPUB-M), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Stanisław M. Pietruszko, June 2002 – December 2003
 The main goal of PV-EC-NET is to increase the efficiency and coherence of the PV RTD Programmes of the EU and the independent EU member- and associated states. Project complementary to the project granted by European Commission 5 Framework Programme on RTD (NNE5-2001-00201).
- [Pro32] **PVNET - Photovoltaic Network** (Sieć fotowoltaiki SPUB-M.), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Stanisław M. Pietruszko, June 2002 – December 2003
 The main objective of PVNET is the development of a roadmap for PV R&D based on a broad consensus among the different technologies, among industry and research institutions, across the whole range from materials to systems. Project complementary to the project granted by European Commission 5 Framework Programme on RTD (NNE5-2000-00548)
- [Pro33] **Determination of UV light generation conditions in active Nd³⁺ doped fibres** (Określenie warunków generacji promieniowania z zakresu ultrafioletu w światłowodach aktywnych domieszkowanych jonami Nd³⁺), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Ryszard Piramidowicz, co-workers: Wiesław Woliński, Michał Malinowski, Marcin Kaczkan, Paweł Szczepański, November 2002 – November 2004
 In the last few years an increasing number of laboratories world-wide have become involved in research and development of optical active fibre devices. Narrow-band, single mode fibre lasers are being developed as potential sources for a wide range of applications. One of the most intensively investigated are short wavelength fibre lasers, especially based on up-conversion pumping mechanisms.
 The main objective of this research project is to design and investigate neodymium doped ZBLAN fibre laser operating in the ultra-violet region of spectrum. In particular – the project covers study of one and two-photon excitation of UV emission in Nd³⁺ doped ZBLAN samples, determination of up-conversion mechanisms, analysis of main deactivation processes (both radiative and nonradiative), modelling of laser action threshold parameters and, finally, lasing experiments.
- [Pro34] **Modelling of transport phenomena and electrical characteristics of the MOS and MOS SOI tunnel devices** (Modelowanie zjawisk transportu i charakterystyk elektrycznych przyrządów tunelowych MOS I MOS SOI), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Bogdan Majkusiak, co-workers: Romuald B. Beck, Jakub Walczak, Aleksander Werbowy, Agnieszka Zaręba, Józef Maciak, Małgorzata Trzaskowska, Kazimierz Dalbiak, Witold Ciemiewski, October 2002 - Januar 2005
 The aim of the project is to investigate and describe physical phenomena responsible for operation of MOS and MOS SOI devices with ultrathin gate oxide layers, that operate with the use of tunnelling or resonance tunnelling phenomenon.
- [Pro35] **Design methodology of analog ASICs based on the notion of virtual prototyping** (Metodologia projektowania analogowych układów ASIC oparta na koncepcji wirtualnego prototypowania), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Zbigniew Jaworski, co-workers: Wiesław Kuźmicz, Andrzej Pfiztner, Adam Wojtasik, Elżbieta Piwowska, Grzegorz Janczyk, Jacek Laskowski, Dominik Kasprowicz, Adam Jarosz, Jerzy Gempel, Stanisław Jeszka, April 2002 - March 2005
 The most difficult problems in the design of analog circuits are design optimization and yield maximization. These tasks require statistical simulation and prototypes manufacturing and measuring, what is time consuming and costly. What 's more, commercial simulators do not account for correlation of device parameters so the simulation results are far from realistic ones. The aim of this project is to propose and build a design environment based on idea of virtual prototyping. This system will provide an engineer with the ability to automatically simulate manufacturing process and obtain required circuit characteristics taking into account process disturbance and correlations of device parameters. In addition, the system will allow to build VHDL-AMS models of analog macros.
- [Pro36] **Analysis of a gas pumping effect in ion argon and krypton lasers** (Analiza i modelowanie zjawisk przepompowywania gazu w jonowych laserach argonowych i kryptonowych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Wojciech Kamiński, March 2003 – December 2004
 The purpose of the project is analysis of gas pumping effect in ion argon and krypton lasers. This is parasitic effect in this kind of lasers which diminishes the efficiency of a laser generation and the life-time of the laser tube. Results will be used to

minimize this effect in the new design of ion argon laser discharge tube with quasi-continuous discharge capillary.

- [Pro37] **Microelectronic semiconductor devices with chemical sensitive carbon film** (Mikroelektroniczne przyrządy półprzewodnikowe z chemoczułą warstwą węglową), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: J. Szmidi, co-workers: T. Guzdek, A. Karczewska, M. Clapa, W. Ciemiowski, K. Dalbiak, M. Trzaskowska. April 2003 – April 2004.
The main goal of the project is development of fabrication technology of open gate metal-insulator-semiconductor field effect transistor (Open Gate MISFET) playing the role of chemical sensitive device. As a chemical sensitive element, a diamond-like carbon (DLC) film with embedded diamond nanocrystallites is applied. Obtained transistor structures demonstrate sensitivity to nitrogen containing organic compounds.
- [Pro38] **Analysis of the short wavelength emission excitation in holmium activated SrLaGa₃O₇ and SrLaGaO₄ crystals** (Warunki wzbudzenia promieniowania krótkofalowego w laserowych kryształach SrLaGa₃O₇ i SrLaGaO₄ aktywowanych jonami holmu), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Michał malinowski, co-worker: Marcin Kaczkan, May 2003 – May 2004
The purpose of this investigation is to study the optical properties of Ho³⁺ in SrLaGa₃O₇ (SLG) and SrLaGaO₄ (SLO) crystals to better understand the behaviour of the rare-earth ions in these hosts and to predict their potential laser properties.
The principal interest in studying rare earth doped SLG and SLO crystals is due to their structural disorder and resulting strong inhomogeneous broadening of the optical transitions and due to the ability of this matrix to accept high concentrations of activator. Holmium ion has been chosen as a dopant because it shows laser action at different wavelengths, from 550 nm to 3.9 μm, in a variety of hosts and offers various upconversion mechanisms which may be enhanced in SLG and SLO system because of their structural properties.
The samples with different activator concentrations were used for the studies. Absorption, emission spectra and observed lifetimes of excited states were measured and discussed using Judd-Ofelt theory. Emissions from ³D₃, ⁵F₃, ⁵S₂, ⁵F₅, ⁵I₅, ⁵I₆, and ⁵I₇ levels were characterized under one-photon and multi-photon excitation. The experimental lifetimes for the ⁵S₂, ⁵F₅, ⁵I₆, ⁵I₇ states were compared to the theoretical values, calculated using Judd-Ofelt theory. Upconverted, ultraviolet emission from the ³D₃ level under cw 647 nm excitation at room temperature was observed and investigated. Based on the energy level diagram of Ho³⁺, the pump intensity dependencies and experimental time dependencies of the observed emissions, an excitation scheme was proposed. The observed line-narrowed fluorescence from ⁵S₂ level of Ho³⁺ ion after selective ⁵I₈ → ⁵S₂ excitation transition was used to analyze the origin of spectral line broadening phenomenon in SLG and SLO hosts.
- [Pro39] **Test vectors generation for digital CMOS integrated circuits based on statistical analysis of manufacturing defects** (Generacja wektorów testowych dla cyfrowych układów scalonych CMOS wykorzystująca statystyczną analizę defektów produkcyjnych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Witold Pleskacz, co-workers: Wiesław Kuźmich, Andrzej Wielgus, Adam Wojtasik, Grzegorz Janczyk, Tomasz Borejko, Jerzy Gempel, Stanisław Jeszka, Andrzej Wąkanis, May 2003 – May 2006
It is well known that classical test generation methods cannot handle the actual behaviour of faulty digital circuits implemented as CMOS integrated circuits (IC). These methods allow to generate test vectors using logic-driven gate-level models to represent the circuit design and abstract fault models (e.g. the stuck-at fault model – SAF) to describe manufacturing defects causing IC failure. As a result the circuit layout, physical defects characteristics and the actual circuit behaviour are ignored. The main aim of the project is development of new methodology for probabilistic modelling of physical defects in CMOS gates and estimation of the effectiveness of test patterns for detecting physical defects. Quality of testing depends also on quality of test patterns generated for a circuit under test. Evaluation criteria for digital circuits testing are fault coverage and test application time. Low efficiency of the classical stuck-at fault model in real defect coverage in CMOS logic has initiated the need of new test approaches. These approaches extend the CMOS standard cells characterisation methodology for voltage defect based testing and for I_{DDQ} testing. The proposed methodology will allow finding the types of faults which may occur in a real IC, to determine their probabilities, and to find the input test vectors that detect these faults. Additionally obtained information can be used for defect oriented fault simulation and test generation at higher levels of circuit abstraction.
- [Pro40] **Semiclassical model of radiation in laser with Photonic Crystal active medium** (Półklasyczny model promieniowania w laserze posiadającym aktywny ośrodek w postaci kryształu fotonowego), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Paweł Czuma, October 2003 – October 2004
The main project purpose is elaborate semiclassical model of light generation in lasers with Photonic Crystal (PC) active medium. This model will take into account both nonlinear phenomena (gain saturation, spatial hole burning, mode competition) characteristic for above threshold laser generation and full spatial electromagnetic field distribution. Elaborating model will let us know influence of PC (eg.: higher gain enhancement near photonic bandgap) on generated light parameters and enable us to optimize parameters to get the best efficiency of light generation in this kind of structures.
- [Pro41] **Extremely shallow (<10nm) silicon implantation (e.g. with nitrogen) for gate stack formation of future generations of microelectronics and nanoelectronic devices** (Ekstremalnie płytko (<10 nm) implantowany (np. Azotem) krzem w konstruowaniu struktur bramkowych dla przyszłych generacji przyrządów mikroelektroniki i nanoelektroniki), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: R.B. Beck, co-workers: K. Domański, G. Gawlik, A. Kudła, Z. Pióro, J. Gibki, S. Szostak, A. Werbowy, J. Walczak, A. Zaręba. October 2003 – April 2006

This project aims at performing detailed studies on the effect of surface region modification by means of extremely shallow ion implantation from plasma on following formation of dielectric layers (gate stacks). The attempt will be made to gain control of these effects that finally would allow e.g. simultaneous formation of gate dielectric layer of different thickness.

- [Pro42] **Electrically conductive adhesives for inner layer connections in printed circuit boards** (Kleje elektrycznie przewodzące do realizacji połączeń międzywarstwowych w płytkach drukowanych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Ryszard Kisiel, co-workers: Ryszard Biaduń, Krystyna Szyłko, Jerzy Kalenik, Zbigniew Szczepański, October 2003 – January 2006

The main goal of the project is to elaborate the family of electrically conductive adhesives for preparing inner connections in double sided PCBs as well as PCB with microvia. Such composition will be based on epoxy resin with Ag fillers and other additives. The main idea of this work is to elaborate the materials which can replace the environmentally harmful process of hole electroplating in PCB production.

- [Pro43] **Analysis of modulation bandwidth in planar lasers with photonic band gap** (Analiza pasma modulacji w laserach planarnych z przerwą fotonową), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Agnieszka Mossakowska-Wyszyńska, co-workers: Paweł Szczepański, Paweł Czuma, Stanisław Jonak, November 2003 – May 2006

In this project, we analyze modulation bandwidth and relaxation oscillations in planar waveguide lasers based on photonic crystal structure. In our theoretical model, we take into account the gain saturation effect, transverse and longitudinal field distribution. We consider laser structures with F-P, DBR and DFB cavities. That model allows to define in easy way the influence of the real structure parameters such as photonic crystal geometry, waveguide geometry, losses as well as strength of feedback on the damping rate and the frequency of relaxation oscillations and 3dB modulation bandwidth. With the help of this model it is possible to define optimal geometry of the laser structures having F-P and DFB cavities, which provides maximal modulation bandwidth for given pumping level (characterized by small signal gain).

4.3. Projects Granted by International Institutions

- [Pro44] **Researches on metal vapour - noble gas discharges for UV laser generation** (Badania wyładowań w mieszaninach gazów szlachetnych i par metali dla generacji laserowej w obszarze ultrafioletu), Research Institute for Solid State Physics and Optics of the Hungarian Academy of Sciences, Hungary, project leader: Tadeusz M. Adamowicz, co-workers: Krzysztof Dzieciołowski, Wojciech Kamiński, 1998 - 2005

Investigations of several noble gas – metal vapour lasing systems (He/Ne-Cu, He/Ne-Zn, He-Ag, He-Au) operating in IR, visible and UV range, diagnostics of plasma and laser medium parameters, modelling of the discharge parameters.

- [Pro45] **High beam quality UV lasers for microelectronics** (Opracowanie ultrafioletowych laserów generujących wysokiej jakości wiązki promieniowania dla zastosowań w mikroelektronice), NATO Science for Peace Programme, Project NATO-SfP-971989-Excimer Lasers, project co-director: Tadeusz M. Adamowicz, co-workers: Krzysztof Dzieciołowski, Wojciech Kwaśniewski, Wojciech Kamiński, Jerzy Kęsik, Piotr Warda, May 1999 – April 2004
The Project other partners are as follow:

Department of Laser Physics of the Institute for Solid State Physics and Optics of the Hungarian Academy of Sciences, (Hungary).

- Department of Experimental Physics of Szeged University, (Hungary).
- Metal Vapour Laser Department of the Institute of Solid State Physics of the Bulgarian Academy of Sciences, (Bulgaria).
- -Ruhr-University Bochum, Arbeitsgruppe für Grundlagen der Elektrotechnik, (Germany).
- Department of Physics, Eindhoven University of Technology, (The Netherlands).
- Centre de Physique des Plasmas et Applications de Toulouse (SPAT), (France).
- Department of Chemistry, University of Antwerp, (Belgium).
- Lasram Laser Ltd., Budapest (Hungary)
- Zakład Ceramiki Specjalnej WACER W. Bujnowski, (Poland).

The main objective of this project is to R&D noble gas-metal vapour ion lasers operating on the UV CuII 248,4 nm transition (Ne-Cu, Ne-CuBr lasers) and ZnII (potential laser transitions of 210 and 193 nm in Ne/He-Zn mixtures). The lasers will be used as oscillators for excimer amplifiers (KrF and ArF) providing good quality laser beam for photolithography of VLSI systems, as well as for deep UV laser spectroscopy.

- [Pro46] **PVNET - Photovoltaic Network** (Sieć fotowoltaiki), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Stanisław M. Pietruszko, 5 European Union Grants Committee UE, project no NNE5-2000-00548, 2001 - 2003

PVNET will bring together representatives of relevant R&D and production areas in photovoltaics. Their main task is to stimulate communication within the whole PV community by organizing expert meetings, workshops and symposia and disseminating the information gathered therein. The main objective of PVNET is the development of a roadmap for PV R&D based on a broad consensus among the different technologies, among industry and research institutions, across the whole range from materials to systems.

- [Pro47] **ENERBUILD—Network Energy in the Built Environment** (Sieć Energia w Budownictwie), European Commission 5 Framework Programme on RTD (ERK6-CT-1999-20001), project leader: Stanisław M. Pietruszko, October 2002 – March 2003
 The EnerBuild RTD Thematic Network has the following objectives: delivering the results of past and current research to potential users in the most important sectors with the greatest dissemination potential, with the overall objective of reducing emissions and improving the energy efficiency of the built environment in Europe, facilitating collaboration and exchange among EC-supported research projects, helping maintain the technical and industrial content of future European energy-related building research and to help identify research priorities forming links with relevant targeted RD&D actions and other Thematic Networks with a view to maximising the effectiveness of the problem-solving effort, encouraging the formation of new RTD partnerships between stakeholders in construction, evaluating the effectiveness of different disseminating strategies and media
- [Pro48] **PV-EC-NET - Network for Co-ordination of European and national RTD Programmes for Photovoltaic Solar Energy** (Koordynacja Europejskiego i Krajowych (Krajów UE) Programów Rozwoju Fotowoltaicznej Energii Słonecznej), European Commission 5 Framework Programme on RTD, project no NNE5-2001-00201, project leader: Stanisław M. Pietruszko, January 2002 – June 2003
 The project will bring together the co-ordinating institutions of the national PV RTD programmes of the member- and associated states of the European Union. The main goal of PV-EC-NET is to increase the efficiency and coherence of the PV RTD Programmes of the EU and the independent EU member- and associated states (hereafter indicated as 'EU and national PV RTD programmes'). PV-EC-NET will therefore collect, analyse and disseminate the information about these EU and national PV RTD programmes. This should be achieved by establishing a Central European PV Information Centre, which will be given the task to co-ordinate the collection, processing and dissemination of this information, resulting in a commonly shared European PV Road Map.
- [Pro49] **REASON (Research and Training Action for System on Chip Design)**, (Badania i szkolenia w zakresie projektowania systemów jednokładowych) (IST-2000-30193), project co-ordinator: Wiesław Kuźmicz (Warsaw University of Technology, Poland), project partners: 22 partners from EU member states and from Central and Eastern Europe, January 2002-December 2004,
 The goal of this project is to facilitate integration of the academic and research institutions of Central and Eastern Europe working in the field of microelectronics into the mainstream R&D activities going on in the EU countries. The main objectives of the project are as follows:
- Raising the level of awareness of industrial problems and the level of competencies among researchers in CEE in methodologies of system-on-chip design and test and analogue and mixed signal IC design for wireless communication, networking, and multimedia.
 - Strengthening of links between academic and industrial partners, in order to facilitate formulation of new RTD projects and formation of project consortia.
 - Maintaining and expanding the research infrastructure in the academic and research institutions of Central and Eastern Europe.
 - Knowledge transfer to the SMEs and raising the level of awareness of the IST programme, in order to facilitate participation of SMEs in FP5 and the next Framework Programme projects.
- [Pro50] **PV Centre - Photovoltaic Centre of Competence in Poland** (Fotowoltaiczne Centrum Doskonałości w Polsce), European Commission 5 Framework Programme on RTD (NNE5-2002-00019), project leader: Stanisław M. Pietruszko, November 2002 – October 2005, SPUB-M.
 The Centre of Photovoltaics (PV Centre) in Poland promotes the widespread use of solar photovoltaic (PV) energy as realistic, reliable, and economic energy sources, to encourage the integration of PV energy into Poland's research, economy, and everyday life. The PV Centre serves as a focal point to conduct and stimulate research and demonstration activities; educate and allow students to work on real-world PV solar energy issues; organise expert meetings, workshops, symposia, and conferences; and disseminate information and address environmental issues.
- [Pro51] **ENERBUILD – Network Energy in the Built Environment** (Sieć Energia w Budownictwie), project leader: Stanisław M. Pietruszko, SPUB-M, January 2002 – March 2003
 The EnerBuild RTD Thematic Network aims to enhance co-operation and the exchange of knowledge between co-ordinators of building sector energy research and development projects supported in the European Commission's Fourth and Fifth Framework programmes. Project complementary to the project granted by European Commission 5 Framework Programme on RTD (NNE5-2001-00837).
- [Pro52] **PV Enlargement – Technology Transfer, Demonstration and Scientific Exchange Action for the Establishment of a strong European PV Sector**, project leader: Stanisław M. Pietruszko, SPUB-M, January 2003 – December 2006
 Important issue of PV-Enlargement project is monitoring of installed PV façade. Meteorological and electrical parameters will be measured and performance of the PV system will be analysed. All the measured data and analysis results will be compared with data from other PV systems installed in the PV Enlargement project. Project complementary to the project granted by European Commission 5 Framework Programme on RTD (NNE5-2001-736).
 21 kW PV system will be installed on the façade of Faculty of Microelectronics and Optoelectronics at Warsaw University

of Technology. That will be the largest PV system (in Poland) and first PV façade in Poland. The PV laboratory will be established. It will be used for research work and education.

- [Pro53] **PV-NAS-NET-Co-ordination of NAS and European Union RTD Programmes on PV Solar Energy** (Koordynacja Europejskiego i Krajowych (Krajów Kandydujących) Programów Rozwoju Fotowoltaicznej Energii Słonecznej), project leader: Stanisław M. Pietruszko, EC FP5 RTD (NNE5-2002-00046), January 2003 – December 2004

The overall objective of the PV-NAS-NET project is better co-ordination of science and technology activities in the sector of photovoltaics in the Newly Associated States (NAS), thus integrating them into the European Research Area. To obtain this, the benchmarking of the national programmes supporting PV will be performed and recommendations for the European Commission and national governments will be formulated.

- [Pro54] **SOLTRAIN- Photovoltaic Training Courses in EU Candidate Countries**, project leader: Stanisław M. Pietruszko, Altener 4.1030/Z/02-67 (ALT-2002-067), February 2003 – January 2005

The main objective of SOLTRAIN is to enlarge the understanding and application of photovoltaic solar electricity power systems in candidate EU member countries through the training courses.

4.4. Other Projects

- [Pro55] **Microsystems - construction, technology, design. Humidity sensor based on silicon** (Mikrosystemy – konstrukcje, technologie, projektowanie. Czujnik wilgotności w oparciu o strukturę krzemu porowatego), project leader: Romuald B. Beck, co-workers: Andrzej Jakubowski, Bogdan Majkusiak, Jan Szmidt, Aleksander Werbowy, Lidia Łukasiak, Sławomir Szostak, Jan Gibki, Agnieszka Zaręba, Jakub Walczak, Witold Ciemiewski, Kazimierz Dalbiak, Małgorzata Trzaskowska, June 2002 – June 2003.

Bussing on the experience accumulated design previous works – the technology of humidity sensor manufacturing is experimentally studies. The sensor with very thin nano-porous silicon layer is expected to allow resistance or capacitance dependence on humidity of ambient atmosphere.

5. DEGREES AWARDED

5.1. D.Sc. Degrees

- [DSc1] Tadeusz Adamowicz, **Diagnostics of laser and discharge plasma parameters in noble gas - metal vapour mixtures**, (Diagnostyka ośrodków laserowych i wyładowczych na mieszaninach gazów szlachetnych i par metali), 14 October 2003

5.2. Ph.D. Degrees

- [PhD1] Piotr Brzozowski, **A model of room-temperature $Cd_xHg_{1-x}Te$ detector of infrared radiation** (Model niechłodzonego fotodetektora podczerwieni opartego o związki $Cd_xHg_{1-x}Te$), supervisor: Andrzej Jakubowski, 20 May 2003
- [PhD2] Krzysztof Domański, **Manufacturing of SOI and micromechanical structures using porous silicon** (Wytwarzanie struktur SOI i struktur mikromechanicznych z wykorzystaniem porowatego krzemu), supervisor: Romuald Beck, 28 January 2003
- [PhD3] Marek Kostana, **Thermally induced metastability of amorphous silicon** (Termicznie indukowana metastabilność krzemu amorficznego), supervisor: Andrzej Jakubowski, 28 January 2003
- [PhD4] Andrzej Wielgus, **Synthesis and simulation of VLSI circuits implementing fuzzy systems** (Synteza i symulacja struktur układów scalonych VLSI implementujących systemy rozmyte), supervisor: Wiesław Kuźmich, October 2003

5.3. M.Sc. Degrees

- [MSc1] Andrzej Berent, **Duplekser częstotliwości do pomiaru intermodulacji II rzędu. Projekt, wykonanie i badanie modelu**, advisor Jerzy Skulski, excellent
- [MSc2] Paweł Bieniek, **Wzmacniacze mikrofalowe o poszerzonym zakresie dynamicznym**, advisor Bogdan Galwas, excellent
- [MSc3] Grzegorz Bzówka, **Implementacja, optymalizacja i badanie właściwości deskryptora temperatury barwowej na potrzeby systemu wyszukiwania obrazów**, advisor Grzegorz Kukielka, excellent
- [MSc4] Marek Celiński, **Metody eliminacji wpływu dyspersji światłowodów w telekomunikacyjnych łączach optycznych**, advisor Piotr Witoński, excellent
- [MSc5] Maciej Chwiłoc, **Badanie właściwości emisyjnych i generacyjnych dielektrycznych struktur mikrosferycznych**, advisor Michał Malinowski, good
- [MSc6] Michał Cuch, **Ultracienkie warstwy tlenko - azotku krzemu (SiO_xNy) wytwarzane metodą wspomaganego plazmą osadzania z fazy lotnej (PECVD)**, advisor Romuald Beck, excellent
- [MSc7] Jacek Dohojda, **Analiza pracy dynamicznej faliowodowych laserów DFB i F-P o strukturze kryształu fotonowego**, advisor Agnieszka Mossakowska-Wyszyńska, excellent
- [MSc8] Anna Domańska, **Badania porównawcze rezonatorów wysokostabilnych cięcia SC. z elektrodami złotymi naporowywanymi na podłożu tytanu i chromu**, advisor Jerzy Kruszewski, excellent
- [MSc9] Piotr Firek, **Tranzystor z warstwą BN w roli dielektryka bramkowego - technologia i charakteryzacja**, advisor Aleksander Werbowy, excellent
- [MSc10] Michał Gałązka, **Technologia i konstrukcja tranzystora MISFET z warstwą diamentową jako dielektrykiem**, advisor Jan Szmidt, excellent
- [MSc11] Adam Getka, **Analiza progowa generacji promieniowania planarnego lasera wykonanego z dwu - wymiarowego kryształu fotonowego**, advisor Agnieszka Mossakowska-Wyszyńska, excellent
- [MSc12] Marcin Gregorczyk, **Optyczny system z multipleksacją na podnośnych do transmisji danych w warunkach przemysłowych**, advisor Bogdan Galwas, very good
- [MSc13] Andrzej Grodzicki, **Automatyczna generacja pamięci SRAM i ROM w technologii CMOS**, advisor Zbigniew Jaworski, excellent
- [MSc14] Robert Grzesiczak, **Realizacja systemu uruchomieniowego do nauki programowania mikrokontrolera 8051**, advisor Sławomir Szostak, good
- [MSc15] Tomasz Gugała, **Projekt układu analizującego zwarcia w bramkach cyfrowych CMOS za pomocą testowania napięciowego**, advisor Witold Pleskacz, excellent
- [MSc16] Robert Jastrzębski, **Neodymowy (Nd^{3+}) laser włóknowy**, advisor Michał Malinowski, very good
- [MSc17] Marek Jonkisz, **Metody detekcji krawędzi obiektów na zaszumionych obrazach cyfrowych**, advisor Grzegorz Kukielka, very good
- [MSc18] Hubert Kamiński, **Wyznaczanie parametrów obrazów cyfrowych i obiektów na obrazach cyfrowych na potrzeby bazy danych fotografii cyfrowych**, advisor Grzegorz Kukielka, good
- [MSc19] Grzegorz Kędzierski, **Rozszerzenie zakresu dynamiki w pomiarach intermodulacji trzeciego rzędu**, advisor Jerzy Skulski, excellent
- [MSc20] Krzysztof Kliczek, **Opracowanie struktury krzemowej dla realizacji mikromechanicznych układów światłowodowych**, advisor Jerzy Kruszewski, excellent

- [MSc21] Krzysztof Klimczak, **Właściwości struktur MIS na węglu krzemu (SiC) z azotkiem aluminium (ALN) jako dielektrykiem**, advisor Jan Szmidt, excellent
- [MSc22] Krzysztof Kołtuś, **Study of optical feedback in an extremely short external cavity semiconductor laser**, advisor Agnieszka Mossakowska-Wyszyńska, excellent
- [MSc23] Paweł Kordas, **Metody redukcji zniekształceń intermodulacyjnych w nadajnikach łączonych optycznych z modulatorami Mach'a Zehnera'a**, advisor Piotr Witoński, excellent
- [MSc24] Artur Kot, **Analiza warunków pracy światłowodowych czujników transmisyjnych**, advisor Michał Borecki, excellent
- [MSc25] Kamila Leśniewska-Matys, **Analiza generacji promieniowania w laserze falowodowym wykonanym na bazie kryształu fotonowego**, advisor Paweł Szczepański, excellent
- [MSc26] Marcin Lubiak, **Ocena przydatności klejów elektrycznie przewodzących do zastosowań mikrofalowych**, advisor Ryszard Kisiel, excellent
- [MSc27] Radosław Łukasiewicz, **Technologia i charakterystyka kondensatorów MOS na podłożu SiC**, advisor Jan Szmidt, excellent
- [MSc28] Marcin Madej, **Rozwój bibliotek komponentów elektronicznych programów symulujących obwody elektroniczne stosowane na wysokich częstotliwościach**, advisor Bogdan Galwas, excellent
- [MSc29] Artur Markowski, **Badanie wpływu warunków eksploatacji na stabilność parametrów elektrycznych przelotek wykonywanych klejami elektrycznie przewodzącymi**, advisor Ryszard Kisiel, good
- [MSc30] Tomasz Matejuk, **Opracowanie systemu monitorującego i analiza pracy systemu fotowoltaicznego Millenniuma zasilającego stacje benzynowe BP**, advisor Stanisław Pietruszko, excellent
- [MSc31] Waldemar Matuszewski, **Modelowanie właściwości częstotliwościowych rezonatorów z akustyczną falą powierzchniową**, advisor Mikołaj Baszun, excellent
- [MSc32] Robert Mroczynski, **Reaktywne trawienie plazmowe (RIE) warstw dielektrycznych**, advisor Romuald Beck, excellent
- [MSc33] Mariusz Mróz, **Opracowanie systemu do pomiaru opóźnienia fali ultradźwiękowej w cieczy**, advisor Mikołaj Baszun, excellent
- [MSc34] Arkadiusz Murzyn, **Implementacja algorytmu ekstrakcji obszarów krytycznych na zwarcia w języku SKILL**, advisor Witold Pleskacz, excellent
- [MSc35] Michał Muzal, **Specjalizowany procesor przeznaczony do wykrywania objawów tachykardii**, advisor Zbigniew Jaworski, excellent
- [MSc36] Mariusz Niedzielski, **Implementacja statystycznego symulatora procesu technologicznego SYPRUS w języku JAVA w architekturze klient-serwer**, advisor Elżbieta Piwowarska, good
- [MSc37] Bartłomiej Perkowski, **Zastosowania przewężeń na włóknach polimerowych w technice czujników optoelektrycznych**, advisor Maria Bełłowska, good
- [MSc38] Adam Piwnicki, **Światłowodowy czujnik przemieszczenia**, advisor Jerzy Kruszewski, excellent
- [MSc39] Maciej Plona, **Analiza strat mocy w torach światłowodów polimerowych**, advisor Michał Borecki, good
- [MSc40] Anna Sidlarewicz, **Metody modyfikacji kodu VHDL umożliwiające samostestowalność układów po syntezie RTL**, advisor Elżbieta Piwowarska, very good
- [MSc41] Łukasz Siwek, **Wpływ procesu napraw na właściwości użytkowe połączeń lutowanych wykonywanych wieloskładnikowymi lutami bezolowowymi**, advisor Ryszard Kisiel, excellent
- [MSc42] Adam Smoleński, **Dwustanowy światłowodowy czujnik zmiany obciążenia**, advisor Maria Bełłowska, excellent
- [MSc43] Ireneusz Sobota, **Implementacja interfejsu IEEE 4881 w stylu komórek standardowych i w FPGA**, advisor Elżbieta Piwowarska, good
- [MSc44] Konrad Ścibisz, **Modelowanie mechanizmów przepływu prądu przez struktury z amorficznymi i nanokrystalicznymi warstwami dielektryków i półprzewodników**, advisor Jan Szmidt, excellent
- [MSc45] Mariusz Torbicz, **Analiza szumów w płamarnych laserach DFB/DBR o symetrii kołowej**, advisor Paweł Szczepański, very good
- [MSc46] Michał Wiatroszak, **Charakterystyka kontaktów do GaN typu p**, advisor Jan Szmidt, excellent
- [MSc47] Jarosław Żelazko, **Korelacja parametrów trawienia i nakładania plazmowego cienkich, dielektrycznych warstw węglowych**, advisor Antoni Siennicki, excellent
- [MSc48] Robert Żmijan, **Zagadnienie propagacji fali elektromagnetycznej we włóknach światłowod.: włókna klasyczne vs włókna o strukturze kryształu fotonowego**, advisor Paweł Szczepański, excellent

5.4. B.Sc. Degrees

- [BSc1] Matyas Balazs, **Uruchomienie procesu wytwarzania warstw BN metodą RF CVD**, advisor Aleksander Werbowy, pass
- [BSc2] Michał Błoński, **Komputerowa wizualizacja propagacji pola elektromagnetycznego w planarnych światłowodach**, advisor Piotr Witoński, very good
- [BSc3] Paweł Broniszewski, **Optymalizacja warunków pracy jonowego lasera argonowego z ceramiczno - metalową rurą wyladowczą**, advisor Jerzy Kęsik, very good
- [BSc4] Łukasz Bućko, **Mikrofalowy czujnik ruchu - część odbiorcza**, advisor Jerzy Skulski, good
- [BSc5] Paweł Chrzanowski, **Algorytmy sprzężonych gradientów w rozwiązywaniu równań półprzewodnikowych**, advisor Andrzej Pfizner, very good
- [BSc6] Marek Cieślak, **Badanie i analiza systemu fotowoltaicznego dołączonego do sieci energetycznej**, advisor Stanisław Pietruszko, excellent

- [BSc7] Piotr Daleszczyk, **Opracowanie procedur obsługi stanowiska do badania jednoczesnościowej pracy lasera argonowego**, advisor Piotr Warda, excellent
- [BSc8] Grzegorz Dorosz, **Projektowanie wzmacniacza dystrybucyjnego do telewizji kablowej**, advisor Jerzy Skulski, good
- [BSc9] Marcin Dubyk, advisor Adam Wojtasik, fairly good
- [BSc10] Mariusz Dudkowski, **Opracowanie głowicy refraktometru światłowodowego**, advisor Maria Beblowska, excellent
- [BSc11] Krzysztof Giętkowski, **Projekt układu realizującego algorytm wnioskowania rozmytego metodą Mamdaniego**, advisor Andrzej Wielgus, excellent
- [BSc12] Jarosław Grabowski, **Sterownik wieloetapowych procesów technologicznych – sprzęt**, advisor Lidia Łukasiak, excellent
- [BSc13] Ryszard Gronau, **Płytką implantacja jonów metodami plazmowymi**, advisor Jan Szmidt, excellent
- [BSc14] Marcin Iwanowicz, **Opracowanie modułów do mikroprocesorowego systemu uruchomieniowego**, advisor Zbigniew Pióro, excellent
- [BSc15] Bartosz Jankowski, **Badania warunków generacji w laserów jonowych na parach metali z ośrodkiem wytwarzanym termicznie**, advisor Tadeusz Adamowicz, very good
- [BSc16] Marcin Jółkowski, **Zastosowanie piramidy gaussianu do segmentacji obrazów cyfrowych**, advisor Grzegorz Kukielka, excellent
- [BSc17] Marcin Kłoda, **Opracowanie bazy danych dla zbiorów fotografii cyfrowych**, advisor Jerzy Woźnicki, very good
- [BSc18] Piotr Kopczyński, **Opracowanie stanowiska pomiarowego do badań charakterystyk półprzewodnikowych źródeł promieniowania**, advisor Agnieszka Mossakowska-Wyszyńska, good
- [BSc19] Janusz Kosko, **Projekt zasilacza do diod laserowych**, advisor Ryszard Piramidowicz, excellent
- [BSc20] Grzegorz Koślacz, **Technologia mikro - rektorów chemicznych kompatybilnych z technologią krzemową**, advisor Romuald Beck, very good
- [BSc21] Tomasz Kozłowski, **Optymalne metody segmentacji obrazów mikroskopowych tkanki biologicznej**, advisor Grzegorz Kukielka, excellent
- [BSc22] Andrzej Lasota, **Dydaktyczne stanowisko laboratoryjne do badań pamięci półprzewodnikowych**, advisor Zbigniew Pióro, excellent
- [BSc23] Piotr Maślankiewicz, **Opracowanie sterowanego komputerowo stanowiska do charakteryzacji struktur MOS metodą pompowania ładunku**, advisor Sławomir Szostak, good
- [BSc24] Andrzej Mazurak, **Studenckie stanowisko laboratoryjne do badania charakterystyk termicznych wybranych elementów i materiałów elektronicznych**, advisor Zdzisław Mączyński, excellent
- [BSc25] Bartłomiej Misztalewski, **Opracowanie głowicy mętnościomierza światłowodowego**, advisor Maria Beblowska, excellent
- [BSc26] Radosław Muszyński, **Struktury z warstwą nanokrystalicznego diamentu jako przyrządy chemoczułe**, advisor Aleksander Werbowy, very good
- [BSc27] Tomasz Nazaruk, **Badanie koherencji promieniowania laserowego**, advisor Agnieszka Mossakowska-Wyszyńska, excellent
- [BSc28] Paweł Nowek, **Sterownik wieloetapowych procesów technologicznych**, advisor Lidia Łukasiak, excellent
- [BSc29] Tomasz Odalski, **Stanowisko do pomiaru napięcia płaskich pasm metodą harmonicznych prądu przesunięcia**, advisor Bogdan Majkusiak, excellent
- [BSc30] Tomasz Olszewski, **Opracowanie układu elektronicznego do monitoringu prędkości przepływu wody chłodzącej laboratoryjnego lasera argonowego**, advisor Piotr Warda, excellent
- [BSc31] Krzysztof Ołowski, **Projekt koncepcyjny średniodystansowego łącza światłowodowego z multipleksacją czterech częstotliwości optycznych o pojemności 10 Gb/s**, advisor Bogdan Galwas, good
- [BSc32] Jan Pakuła, **Wyznaczanie składu warstwy ALxGa1-xAg, w zakresie 0xz1 przy użyciu różnych technik pomiarowych**, advisor Agata Jasik, excellent
- [BSc33] Daniel Paluch, **Przyrząd do pomiaru temperatury i wilgotności względnej - projekt wykonanie i badanie modelu**, advisor Jerzy Skulski, very good
- [BSc34] Marcin Pawlak, **Monitorowanie systemu voltaicznego zasilającego układ wolnostojący**, advisor Stanisław Pietruszko, excellent
- [BSc35] Sebastian Pióro, **Charakteryzacja struktur MIM z warstwami diamentopodobnymio niskiej stałej dielektrycznej**, advisor Jan Szmidt, excellent
- [BSc36] Paweł Rebeniak, **Projekt lokalnej światłowodowej sieci dystrybucji sygnałów telewizyjnych**, advisor Bogdan Galwas, very good
- [BSc37] Adam Rudziński, **Zagadnienie emisji spontanicznej w kryształach fotonicznych**, advisor Paweł Szczepański, excellent
- [BSc38] Artur Rusiecki, **Pomiary parametrów fotorefrakcyjnych przetworników zawierających nematyczne mieszaniny ciekłokrystaliczne**, advisor Tomasz Grudniewski, pass
- [BSc39] Adam Ryter, **Analiza wpływu składu chemicznego lutu bezolowiowego SnAgCu z dodatkami na właściwości mechaniczne i elektryczne połączeń lutowanych**, advisor Ryszard Kisiel, excellent
- [BSc40] Rafał Sadowski, **Opracowanie systemu zabezpieczeń dla serwera symulacji charakterystyk elektrycznych przyrządów półprzewodnikowych**, advisor Sławomir Szostak, excellent
- [BSc41] Patryk Sałapski, **Zbadanie relacji między różnymi technikami wykrywania mikropołączeń pod kątem ich niezawodności**, advisor Zbigniew Szczepański, good
- [BSc42] Grzegorz Sierzputowski, **Analiza modelowa systemu rozproszonego projektowania inżynierskiego**, advisor Mikołaj Baszun, excellent
- [BSc43] Tomasz Sochacki, **Mikrofalowy czujnik ruchu - część nadawcza**, advisor Jerzy Skulski, good
- [BSc44] Katarzyna Stankiewicz, **Oprogramowanie nadrzędne do sterowania wieloetapowych procesów technologicznych**, advisor Lidia Łukasiak, excellent

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- [BSc45] Piotr Syryczyk, **Technologia połączeń dla czujników pomiarowych opartych na przestrzennych strukturach krzemowych**, advisor Zbigniew Szczepański, excellent
- [BSc46] Karol Szacki, **Projekt topografii komórek standardowych dla submikrometrowej technologii CMOS**, advisor Andrzej Wielgus, very good
- [BSc47] Marcin Szulik, **Projekt układu generującego odpowiedzi sterownika rozmytego metodą środka ciężkości**, advisor Andrzej Wielgus, excellent
- [BSc48] Grzegorz Ścibisz, **Opracowanie interfejsu pomiarowego dla stanowiska do badań transformatorów impulsowych**, advisor Janusz Rogowski, good
- [BSc49] Arkadiusz Tomaszewicz, **Ekstrakcja parametrów tranzystora bipolarnego krzemowo - germanowego na podst. charakterystyk statycznych**, advisor Sławomir Szostak, very good
- [BSc50] Wojciech Woźniak, **Oprogramowanie systemu elektroniczno - ultradźwiękowego do badania lepkości cieczy**, advisor Mikołaj Baszun, excellent
- [BSc51] Michał Zyżek, **Minimalne rozmiary tranzystora MOS**, advisor Andrzej Jakubowski, fairly good

6. PUBLICATIONS

6.1. Scientific and Technical Papers published in Journals Included in the ISI¹ Database

Number	Journal	Authors	Title	Volume	Pages
[Pub1]	Applied Physics B	G.Bano, P.Horvath, Z.Donko, K.Rozsa, T.M.Adamowicz	Sputtered and heated high-voltage hollow-cathode zinc lasers	77	403-407
[Pub2]	Applied Energy	S.M.Pietruszko	Photovoltaics in the World and in Poland	74	169-175
[Pub3]	Applied Energy	S.M.Pietruszko, M.Gładzki	Performance of the grid connected small PV systems in Poland	74	177-184
[Pub4]	Diamond and Related Materials	M.Śmietana, J.Szmidt, M.Dudek, P.Niedzielski	Optical properties of diamond-like cladding for optical fibres		4 p.
[Pub5]	Diamond and Related Materials	T.Guzdek, J.Szmidt, M.Dudek, P.Niedzielski	NDC film as an active gate layer in chemFET structures		3 p.
[Pub6]	IEEE Journal of Quantum Electronics	A.Mossakowska-Wyszyńska	Modulation bandwidth of planar circular grating distributed bragg reflector lasers	vol.39 no.9	1129-1134
[Pub7]	IEEE Trans. on Applied Superconductivity	M.V.Jacob, J.Mazierska, K.Leong, D.Ledenyov, J.Krupka	Surface resistance measurements of HTS thin films using SLAO dielectric resonator	13	2909-2912
[Pub8]	IEEE Trans. on Microwave Theory Tech	B.Riddle, J.Baker-Jarvis, J.Krupka	Complex Permittivity Measurements of Common Plastics over Variable Temperatures	51	727-733
[Pub9]	Journal of Physics D: Applied Physics	J.Krupka, A.Abramowicz, K. Derzakowski	Magnetically Tunable Dielectric Resonators Operating at Frequencies about 2 GHz	36	1-6
[Pub10]	Journal of the European Ceramic Society	J.Krupka	Developments in techniques to measure dielectric properties of low-loss materials at frequencies of 1–50 GHz	23	2607-2610
[Pub11]	Journal of the European Ceramic Society	J.Mazierska, M.V.Jacob, A.Harring, J.Krupka, P.Barnwell, T.Sims	Measurements of loss tangent and relative permittivity of LTCC ceramics at varying temperatures and frequencies	23	2611-2615
[Pub12]	Journal of the European Ceramic Society	M.V.Jacob, J.Mazierska, D.Ledenyov, J.Krupka	Microwave characterization of CaF ₂ at cryogenic temperatures using a dielectric resonator technique	23	2617-2622
[Pub13]	Materials Chemistry and Physics	J.Krupka	Precise measurements of the complex permittivity of dielectric materials at microwave frequencies	79	195-198
[Pub14]	Measurements Science and Technology	J.D.Anstie, J.G.Hartnett, M.E.Tobar, J.Winterflood, D.Cros, J.Krupka	Characterization of a spherically symmetric fused-silica-loaded cavity microwave resonator	14	286-293
[Pub15]	Microelectronics Reliability	D.Kasproicz, W.A.Pleskacz	Improvement of integrated circuit testing reliability by using the defect based approach	43/6	945-953
[Pub16]	Optica Applicata	M.Borecki	Light behaviour in polymer optical fibre bend – a new analysis method	vol. XXXIII, no. 1	191-204
[Pub17]	Optical Materials	S.Nicolas, E.Descroix, M.F.Joubert, Y.Guyot, M.Laroch, V.V.Semashko, R.Moncorge, A.A.Tkatchuk, M.Malinowski	Potentiality of Pr ³⁺ - and Pr ³⁺⁺ Ce ³⁺ - doped crystals for tuneable UV upconversion lasers	22	139 - 146
[Pub18]	Optical Materials	P.Moretti, M.-F.Joubert, S.Tascu, B.Jacquier, M.Kaczkan, M.Malinowski, J.Sarnecki	Luminescence of Nd ³⁺ in proton or helium-implanted channel waveguides in Nd:YAG crystals	24	315-319
[Pub19]	Opto-Electronics Review	R.Pająk	Use of two-dimensional matched filters for estimating a length of blood vessels newly	11	237 - 241

¹ Institute for Scientific Information (Philadelphia, USA)

			created in androgenesis process.		
[Pub20]	Opto-Electronics Review	T.Grudniewski, J.Parka	Properties of different LC cells with high optical anisotropy as a dynamic holographic media.	11	243-245
[Pub21]	Physica Status Solidi	M.Godlewski, J.Szmidt, A.Olszyna, A.Werbowy, E.Łusakowska, M.R.Philips, E.M.Goldys, A.Sokołowska	Luminescent properties of wide bandgap materials at room temperature		6 p.
[Pub22]	Radiation Effects & Defects in Solids	A.Wnuk M.Kaczkan, R.Piramidowicz, R.Mahiou, G.Chadeyron, M.-F.Joubert, M.Malinowski	Dynamics of the up-conversion emission in holmium doped ZBLAN fiber	158	469 - 473
[Pub23]	Superconductor Science and Technology	M.V.Jacob, J.Mazierska, J.Krupka	A cryogenic post dielectric resonator for precise microwave characterization of planar dielectric materials for superconducting circuits	17	358-362
[Pub24]	Surface Coatings Technology	A.Werbowy, K.Zdunek, E.Dusiński, J.Szmidt, M.Elert	Impulse plasma deposition of aluminum oxide layers for Al ₂ O ₃ / Si, SiC, GaN systems	174-175	170-175
[Pub25]	Thin Solid Films	J.Szmidt, M.Gazicki-Lipman, H.Szymanowski, R.Mazurczyk, A.Werbowy, A.Kudła	Electrophysical properties of thin germanium/carbon layers produced on silicon using organometallic radio frequency plasma enhanced chemical vapor deposition process	441	192-199
[Pub26]	Thin Solid Films	A.Werbowy, A.Olszyna, K.Zdunek, A.Sokołowska, J.Szmidt, A.Barcz	Peculiarities of thin deposition by means of reactive impulse plasma assisted chemical vapour deposition (IPD) method		5 p.
[Pub27]	Vacuum	R.B.Beck, M.Giedz, A.Wojtkiewicz, A.Kudła, A.Jakubowski	PECVD formation of ultrathin silicon nitride layers for CMOS technology	70	323-329
[Pub28]	Vacuum	A. Szczęsny, P.Śniecikowski, J.Szmidt, A.Werbowy	Reactive ion etching of novel materials – GaN and SiC	70	249-254

6.2. Scientific and Technical Papers Published in Journals not Included in the ISI Database

Number	Journal	Authors	Title	Volume	Pages
[Pub29]	Elektronika	M.Sochacki, J.Szmidt, K.Zdunek, E.Dusiński	Diody Schottky'ego na podłożach z węgla krzemu	XLIV no 7	3-9
[Pub30]	Elektronika	J.Szmidt, A.Werbowy, A.Jakubowski, L.Łukasiak	Materiały i technologie dla systemów mikroelektronicznych i optoelektronicznych	XLIV No 8-9'2003	32-36
[Pub31]	Elektronizacja	M.Śmietana, J.Kalenik	Głowica światłowodowego czujnika zmian współczynnika załamania lub poziomu cieczy oparta na światłowodzie grubordzeniowym.	11	34-36
[Pub32]	Elektronizacja	A.Łuczyk, W.A.Pleskacz	Estymacja odległości Hamminga przy wykorzystaniu zjawisk ładunkowych	10/2003	16-18
[Pub33]	Elektronizacja	R.Pająk	Wyznaczenie długości nowych naczyń, powstałych w procesie angiogenezy, metodą dwuwymiarowych filtrów dopasowanych	3	24-26
[Pub34]	Materials Science in Semiconductor Processing	R.B.Beck	Formation of ultrathin silicon oxides – modeling and technological constrains	6	49-57
[Pub35]	Materials Science in Semiconductor Processing	A.Pfitzner, A.Lejman	Fast mixed modeling of doping for statistical process/ device silumation	6	21-26
[Pub36]	PAN Polski Biuletyn Ceramiczny „Ceramika”	W.Olesińska, J.Kęsik	Złącza warstwowe ceramika SiC-Mo spajane lutami wysokotemperaturowymi	80	869-874
[Pub37]	Polska Energetyka Słoneczna	S.M.Pietruszko	Fotowoltaika – słoneczna energia elektryczna	No 1	19-22
[Pub38]	Polski Biuletyn	W.Kamiński, J.Kęsik,	Naprężenia własne w złączach SiC-Cu w	80	863-868

	Ceramiczny „Ceramika” PAN	D.Kaliński, M.Chmielewski	jonowym laserze argonowym		
[Pub39]	Przegląd Telekomunikacyjny	A.Jakubowski, L.Łukasik	O telekomunikacyjnych pożytkach z elektroniki wynikających	LXXVI no 1	5-11
[Pub40]	Radioelectronics & Informatics – Scientific- Technical Journal	W.A.Pleskacz	Deffect analysis and probability evaluation for improving test generation	3(24)	206
[Pub41]	Radioelectronics & Informatics – Scientific- Technical Journal	W.Kuźmicz, Z.Jaworski	Veryfication of manufacturability of IC designs	3	11-18
[Pub42]	Radioelektronik	R.Kisiel, C.Rudnicki	Płytki drukowane i ich wpływ na konstrukcje elektroniczne	No 2	20–22
[Pub43]	Radioelektronik	R.Kisiel, C.Rudnicki	Podzespoły SMD	No 3	16-18
[Pub44]	Radioelektronik	R.Kisiel, C.Rudnicki	Zasady projektowania płytek drukowanych	No 4	12-14
[Pub45]	Radioelektronik	R.Kisiel, C.Rudnicki	Procesy Technologiczne montażu powierzchniowego, part 1	No 5	28-29
[Pub46]	Radioelektronik	R.Kisiel, C.Rudnicki	Procesy Technologiczne montażu powierzchniowego, part 2	No 6	13-15
[Pub47]	Radioelektronik	R.Kisiel, C.Rudnicki	Procesy Technologiczne montażu powierzchniowego, part 3	No 7	8-9
[Pub48]	Radioelektronik	R.Kisiel, C.Rudnicki	Naprawa obwodów drukowanych	No 8	15-16

6.3. Scientific and Technical Papers Published in Conference Proceedings

Number	Conference	Authors	Title	Country	Volume	Pages
[Pub49]	1 st SWH International Conference Solar- Wind-Hydrogen/Fuel Cells – (Renewable Energies)	S.M.Pietruszko	"The Status of Pholtovoltaics in Central and Eastern Europe" Abstract Full Presentation	Segovia, Spain		
[Pub50]	2nd International Conference on Multimedia and ICTs in Education (m- ICTE2003)	J.Pluta, E.Szerewicz, I.Strzałkowski, M.Kowalski, T.Pawlak, K.Wosińska, B.Galwas, P.Witoński	The E-Book Of Physics For Distance Learning	Badajoz Spain		
[Pub51]	3rd International EconomicCongress Opportunities of Change	K.Messa, B.Czejdo, M.Baszun	Graphical queries for XML documents	Gdańsk, Poland	1	269 - 276
[Pub52]	5 th Intern.Conf. Thermal Problems in Electronics – Microtherm 2003	Z.Lisik, S.Mitura, A.Werbowy, M.Langer, E.Raj, P.Przymusiąła	Forced liquid cooling in power modules	Łódź, Poland		237-243
[Pub53]	5 th Intern.Conf. Thermal Problems in Electronics – Microtherm 2003	R.Łukasiewicz, J.Szmidt, M.T.Htun Aung	Temperature properties of SiO ₂ on silicon carbide	Łódź, Poland		159-164
[Pub54]	5 th Intern.Conf. Thermal Problems in Electronics – Microtherm 2003	E.Dusiński, P.Śniecikowski, J.Szmidt, M.Elert, K.Zdunek	Properties of metal-oxides structures produced on silicon carbide substrates for high-temperature applications	Łódź, Poland		
[Pub55]	5 th Intern.Conf. Thermal Problems in Electronics – Microtherm 2003	K.Klimczak, M.Sochacki, J.Szmidt, A.Werbowy, A.Olszyna	Stability of properties of AlN layers produced by RPP method on SiC in temperatures reaching 500°C	Łódź, Poland		
[Pub56]	5 th Intern.Conf. Thermal Problems in Electronics – Microtherm 2003	A.Kolendo, M.Sochacki, A.Werbowy, J.Szmidt	Formation of ohmic Ni contacts to 4H- SiC by high temperature annealing	Łódź, Poland		
[Pub57]	5 th Intern.Conf. Thermal Problems in	P.Firek, A.Werbowy, J.Szmidt,	Influence of temperature on electronic properties of nanocrystalline c BN films	Łódź, Poland		

	Electronics – Microtherm 2003	A.Olszyna				
[Pub58]	6 th Symposium “Diagnostics and Yield – Advanced Silicon Devices and Technologies for ULSI Era”	W.Grabiński, D.Tomaszewski, L.Lemaitre, A.Jakubowski	Standarization of the compact model coding: non-fully depleted SOI MOSFET example	Warsaw Poland	CD	6 p.
[Pub59]	6 th Symposium “Diagnostics and Yield – Advanced Silicon Devices and Technologies for ULSI Era”	R.B. Beck, A.Jakubowski	Ultrathin oxynitride films for CMOS technology	Warsaw Poland	CD	7 p.
[Pub60]	6 th Symposium “Diagnostics and Yield – Advanced Silicon Devices and Technologies for ULSI Era”	L.Łukasiak, A.Jakubowski, Z.Pióro	Silicon microelectronics: where we have come from and where we are heading	Warsaw Poland	CD	7 p.
[Pub61]	6 th Symposium “Diagnostics and Yield – Advanced Silicon Devices and Technologies for ULSI Era”	J.Walczak, B.Majkusiak	Scattering mechanisms in MOS/SOI devices with ultrathin semiconductor layers	Warsaw Poland	CD	10 p.
[Pub62]	6 th Symposium “Diagnostics and Yield – Advanced Silicon Devices and Technologies for ULSI Era”	T.Bieniek, R.B.Beck, A.Jakubowski, A.Kudła	Ultra shallow nitrogen plasma implantation for ultrathin silicon oxynitride (SiOxNy) layers formation	Warsaw Poland		
[Pub63]	6 th Symposium “Diagnostics and Yield – Advanced Silicon Devices and Technologies for ULSI Era”	R.B.Beck, M.Giedz, A.Wojtkiewicz, A.Kudła, A.Jakubowski	Electrophysical properties of formed by PECVD ultrathin (<6.0 nm) silicon nitride layers	Warsaw Poland		
[Pub64]	6 th Symposium “Diagnostics and Yield – Advanced Silicon Devices and Technologies for ULSI Era”	R.B.Beck, M.Cuch, A.Wojtkiewicz, A.Kudła, A.Jakubowski	Thermal stability of formed by PECVD ultrathin (<6.0 nm) silicon oxynitride layers determined by optical and electrical measurements	Warsaw Poland		
[Pub65]	6 th Symposium “Diagnostics and Yield – Advanced Silicon Devices and Technologies for ULSI Era”	M.Sochacki, A.Kolendo, J.Szmidt, A.Werbowy	Characterization of Pt/4H/-SiC Schottky diodes	Warsaw Poland		
[Pub66]	6 th Symposium Diagnostics & Yield: Advanced Silicon Devices and Technologies for ULSI Era	R.Kisiel, Z.Szczepański	Trends in assembling of advanced ic packages	Warsaw, Poland		1 - 6
[Pub67]	8 th European Vacuum Congress	M.Niewiński	The distributed MC simulation of dynamic expansion system,	Berlin, Germany		
[Pub68]	8 th European Vacuum Congress	P.Szwemin, K.Jousten, K.Szymański	The gas flux distribution in the XHV chamber of the vacuum primary standard CE3 developed by PTB	Berlin, Germany		
[Pub69]	8 th European Vacuum Congress	P.Szwemin	The influence of the blocking plate diameter on the gas flux distribution in the calibration chamber	Berlin, Germany		

[Pub70]	10 th International Topical Meeting on Optics of Liquid Crystals	J.Parka, T.Grudniewski, E.Nowinowski, Yu.Kurioz	Photorefractive effects in nematic liquid crystal cells with different orientation layers	Universite d'Artois France	CD ROM	
[Pub71]	10 th International Topical Meeting on Optics of Liquid Crystals	J.Parka, T.Grudniewski, Yu.Kurioz, R.Dąbrowski	Liquid crystals with high photorefractive index and different cell construction solutions for optical light modulators	Universite d'Artois France	CD ROM	
[Pub72]	10th International Conference: "Mixed Design of Integrated Circuits and Systems" – MIXDES 2003	D.Tomaszewski, W.Grafiński, L.Lemaitre, A.Jakubowski	Silicon-on-Insulator MOSFET modeling and its verilog-coding	Poland		105-110
[Pub73]	10th International Conference: "Mixed Design of Integrated Circuits and Systems" – MIXDES 2003	W.Kuźmicz	Introduction to Design for Manufacturability: Random Variations, Defects, Faults, Yield and Cost	Łódź, Poland		119-123
[Pub74]	10th International Conference: "Mixed Design of Integrated Circuits and Systems" – MIXDES 2003	Z.Jaworski	Methodologies for Yield Optimization and Design Centering	Łódź, Poland		124-129
[Pub75]	10th International Conference: "Mixed Design of Integrated Circuits and Systems" – MIXDES 2003	A.Łuczyk, W.A.Pleskacz	Charge-Based Computation of Hamming Distance	Łódź, Poland		597-600
[Pub76]	10th International Conference: "Mixed Design of Integrated Circuits and Systems" – MIXDES 2003	G.Jańczyk	Bipolar Mechanism Present in Short Channel SOI-MOSFET Transistors	Łódź, Poland		409-412
[Pub77]	10th International Conference: "Mixed Design of Integrated Circuits and Systems" – MIXDES 2003	J.Siwik, E.Piwowarska, J.Marzec, D.Bujalski	BiCMOS Low Noise Amplifier-Shaper-Discriminator for Help Experiments Drift Chambers	Łódź, Poland		168-173
[Pub78]	10th International Conference: "Mixed Design of Integrated Circuits and Systems" – MIXDES 2003	J.Górny, E.Piwowarska	Interpolating Filter for Audio Purposes	Łódź, Poland		615-620
[Pub79]	10th International Conference: "Mixed Design of Integrated Circuits and Systems" – MIXDES 2003	V.Nelayev, V.Stempitsky, K.Kudin, W.Kuźmicz	Design and Simulation via Internet	Łódź, Poland		665-668
[Pub80]	10th International Conference: "Mixed Design of Integrated Circuits and Systems" – MIXDES 2003	E.Piwowarska	Propagation Problems in VLSI Circuits	Łódź, Poland		134-139
[Pub81]	13 th Bi-annual Conf. Insulating Films on Semiconductors INFOS'2003	B.Majkusiak	Comparison of Resonant Tunneling Currents in Double Gate MOS Diodes with Metal and Poly-Silicon Gates	Barcelona, Spain	PS12-13	2 p.
[Pub82]	14 th European Conf. On Diamond, Diamond-like Materials, Carbon Nanotubes, Nitrides &	M.Słapa, J.Szmidt, M.Dudek, W.Czarnecki, M.Traczyk, A.Werbowy, et al.	Ultra-thin nanocrystalline diamond detectors	Salzburg Austria		Abstract Book – 5.5.5

	Silicon Carbide – DIAMOND-2003					
[Pub83]	14 th European Conf. On Diamond , Diamond-like Materials, Carbon Nanotubes, Nitrides & Silicon Carbide – DIAMOND-2003	T.Guzdek, J.Szmidt, M.Dudek, P.Niedzielski	NDC film as an active gate layer in chemFET structures	Salzburg Austria		Abstract Book – 5.5.4
[Pub84]	14 th European Conf. On Diamond , Diamond-like Materials, Carbon Nanotubes, Nitrides & Silicon Carbide – DIAMOND-2003	M.Śmietana, J.Szmidt, M.Dudek, P.Niedzielski	Optical properties of diamond-like clad for optical fibers	Salzburg Austria		Abstract Book – 15.3.11
[Pub85]	14 th European Conf. On Diamond , Diamond-like Materials, Carbon Nanotubes, Nitrides & Silicon Carbide – DIAMOND-2003	J. Szmidt, E. Kowalska, H.Lange, A. Huczko, A.Werbowy, K. Kłos	Effect of substrate characteristics on the morphology of 1D nanocarbons produced by the catalytic CVD and non-thermal plasma methods	Salzburg Austria		Abstract Book – 15.6.3
[Pub86]	27th International Conference and Exhibition IMAPS-Poland	Z.Szczepański	Simplified flip chip solder bonding on FR-4 laminate.	Poland, Podlesice		266-269
[Pub87]	27th International Conference and Exhibition IMAPS-Poland	M.Jakubowska, J.Kalenik, A.Miecznik, E.Zwierkowska	Electrical and stability properties of molybdenum xide based thick film resistors	Poland, Podlesice		174-176
[Pub88]	27th International Conference and Exhibition IMAPS-Poland	R.Kisiel	Trends in soldering processes for advanced microelectronic assembly	Poland, Podlesice		83-87
[Pub89]	27th International Conference and Exhibition IMAPS-Poland	R.Kisiel, A.Markowski	Preliminary results of conductive adhesive fillet resistance stability in double sided PCBS	Poland, Podlesice		196-199
[Pub90]	Biocybernetics and Biomedical Engineering (Official journal of the Institute of Biocybernetics and Biomedical Engineering Polish Academy of Sciences)	A.Bardossy, A.Blinowska, Z.Jaworski, W.Kuźmich, J.Ollitrault, A.Penciolelli, D.Sarna, A.Wałkanis, A.Wielgus, A.Wojtasik	Application of Fuzzy Logic to Pacemaker Control	Poland	1	7-28
[Pub91]	Cleo Europe EQEC	T.Kossek, P.Szczepański, R.Paszkwicz	Above threshold analysis of mode discrimination in circular grating surface-emitting lasers with saturable absorber	Munch ICM, Germany	27E	Code CL4T
[Pub92]	Cleo Europe EQEC	A.Mossakowska-Wyszyńska, P.Szczepański	Dynamic operation of photonic crystal planar waveguide DFB and F-P lasers	Munch ICM, Germany	27E	Code CM1T
[Pub93]	Cleo Europe EQEC	W.Kamiński, J.Kęsik	Ion argon laser discharge tube with controlled gas pumping effect	Munch ICM, Germany	27E	
[Pub94]	Co-operation exchange „Renewable Energy” with Central and Eastern European countries	S.M.Pietruszko, A.Leś, K.Ziemlicki	Renewable Energy in Poland	Wien, Austria		
[Pub95]	E-CORE Workshop FP6 & Construction Research in the	S.M.Pietruszko	Photovoltaics related projects in Poland	Warsaw, Poland		

	Enlarged European Union					
[Pub96]	EURESCO Conference „Photovoltaics and Environment”	S.M.Pietruszko, A.Kozłowski	„1 kW PV system on school in Warsaw-Wawer”	Granada, Spain		
[Pub97]	EURESCO Conference „Photovoltaics and Environment”	S.M.Pietruszko, W.Pietnoczka	„Metastability in amorphous silicon with small hydrogen content”	Granada, Spain		
[Pub98]	European Materials Research Society, EMRS-2003, Fall Meeting	A. Sokołowska, A.Werbowy, A. Barcz, M.Godlewski, J.Szmidt, A.Olszyna	Luminescent properties of wide bandgap materials at room temperature	Warsaw Poland		
[Pub99]	European Materials Research Society, EMRS-2003, Fall Meeting	P.Hoffmann, D.Schmeißer, R.B.Beck, A.Jakubowski	Photoemission studies of very thin (<10nm) silicon oxynitride (SiO _x N _y) layers formed by PECVD	Warsaw Poland		
[Pub100]	European Vacuum Congress Berlin 2003, 8 th European Vacuum Conference and 2 nd Annual Conference of the German Vacuum Society,	A. Werbowy, A.Olszyna, A.Sokołowska, J.Szmidt, K. Zdunek, A.Barcz	Peculiarities of thin deposition by means of reactive impulse plasma assisted chemical vapour deposition (IPD) method	Berlin, Germany		
[Pub101]	II Krajowa Konferencja Naukowo-Techniczna „Tanie ciepło dla budownictwa mieszkaniowego”	S.M.Pietruszko	Wykorzystanie energii słonecznej do produkcji energii elektrycznej – Fotowoltaika	Wrocław, Poland		171-184
[Pub102]	II Krajowa Konferencja Naukowo-Techniczna „Tanie ciepło dla budownictwa mieszkaniowego”	S.M.Pietruszko	Wykorzystanie energii słonecznej do produkcji energii elektrycznej - Fotowoltaika	Wrocław, Poland		
[Pub103]	III Konferencja i Warsztaty „Uniwersytet Wirtualny: model, narzędzia i praktyka”	B.Galwas	Gałęziowy model podręcznika multimedialnego	Warszawa, Poland		
[Pub104]	III Konferencja i Warsztaty „Uniwersytet Wirtualny: model, narzędzia i praktyka”	B.Galwas	Wirtualna Politechnika - koncepcja i cele	Warszawa, Poland		
[Pub105]	III Konferencja i Warsztaty „Uniwersytet Wirtualny: model, narzędzia i praktyka”	B.Galwas	Technika prowadzenia przedmiotu i droga do zaliczenia w Zaocznych Studiach na Odległość	Warszawa, Poland		
[Pub106]	III Konferencja i Warsztaty „Uniwersytet Wirtualny: model, narzędzia i praktyka”	S.Nowak, B.Galwas	Informatyka i Techniki Internetu - Druga edycja Studiów Podyplomowych przez Internet	Warszawa, Poland		14 p.
[Pub107]	Int. Symp. on 50th Anniversary of the Death of prof. J.Czocharski	M.Nakielska, M.Chwiloc, M.Malinowski, D.A.Pawlak	YAG:Pr single crystals for microsphere lasers	Toruń, Kcynia, Poland		
[Pub108]	International Symposium Chemical	R.B.Beck, M.Cuch, A.Wojtkiewicz,	Very thin (<10nm) silicon oxynitride (SiO _x N _y) layers formed by PECVD		Vol.2	1380-1386

	Vapor Depositon XVI and EUROCVI 14, M.D.Allendorf et al. (eds.) "The Electrochemical Society-ECS", Proceedings	A.Kudła, A.Jakubowski				
[Pub109]	International Symposium Silicon-on-Insulator Technology and Devices XI, S.Cristoloveany et al. (eds.)	L.Łukasiak, E.Kamieniecki, A.Jakubowski, J.Rużyło	Feasibility of surface photo-voltage based characterization of ultra-thin SOI wafers		Vol. 05	425-430
[Pub110]	International Symposium Silicon-on-Insulator Technology and Devices XI, S.Cristoloveany et al. (eds.)	J.Walczak, B.Majkusiak	Modeling of coulomb scattering of electrons in ultrathin symmetrical DG SOI transistor		Vol. 05	355-360
[Pub111]	ISES Solar World Congress 2003	S.M.Pietruszko, M.Grażdzki	1 kWp Grid Connected PV System in Warsaw (Two Years of Experience)	Stockholm, Sweden		4 p. CD ROM
[Pub112]	ISES Solar World Congress 2003	S.M.Pietruszko, A.Mikołajuk et al.	Status of Photovoltaics in Newly Associated Countries	Stockholm, Sweden		4 p. CD ROM
[Pub113]	ISES Solar World Congress 2003	A.Patryn, S.M.Pietruszko	A Virtual Student's Laboratory on Solar Cells Parameters Analysis	Stockholm, Sweden		8 p. CD ROM
[Pub114]	IV Konferencja Polskiego Towarzystwa Ceramicznego	W.Kamiński, J.Kęsik, D.Kaliński, M.Chmielewski	Napężenia własne w złączach SiC-Cu w jonowym laserze argonowym	Zakopane, Poland		
[Pub115]	IX Konferencja Naukowa „Światłowodowy i ich zastosowania”	P.Czuma, P.Szczepański	Nieliniowy model generacji promieniowania w laserze Fabry-Perrot o strukturze jednowymiarowego kryształu fotonowego	Krasno-bród, Poland	I	52-59
[Pub116]	IX Konferencja Naukowa „Światłowodowy i ich zastosowania”	A.Mossakowska-Wyszyńska, K.Leśniewska-Matys, P.Szczepański	Modelowanie generacji promieniowania w falowodowym planarnym laserze z dwu-wymiarowym kryształem fotonowym	Krasno-bród, Poland	I	108-114
[Pub117]	IX Konferencja Naukowa „Światłowodowy i ich zastosowania”	R.Paszkievicz, A.Tyszka-Zawadzka, P.Szczepański	Efekt nadmiarowy w laserze o strukturze kryształu fotonowego	Krasno-bród, Poland	II	655
[Pub118]	IX Konferencja Naukowa „Światłowodowy i ich zastosowania”	M.Borecki, J.Kruszewski	Identyfikacja parametrów aktywnego włókna optycznego domieszkowanego erbem	Krasno-bród, Poland		185-190
[Pub119]	IX Konferencja Naukowa „Światłowodowy i ich zastosowania”	M.Borecki, J.Kruszewski	Wzmocnienie i szumy w rzeczywistym włóknie aktywnym – model doświadczalny i matematyczny	Krasno-bród, Poland		191-197
[Pub120]	IX Konferencja Naukowa „Światłowodowy i ich zastosowania”	M.Borecki, J.Kruszewski	Projektowanie mikro – opto - mechanicznego czujnika wibracji	Krasno-bród, Poland		296-302
[Pub121]	IX Konferencja Naukowa „Światłowodowy i ich zastosowania”	M.Borecki, J.Kruszewski	Mechanizm strat mocy sygnału optycznego w rzeczywistych torach wykonanych ze światłowodów polimerowych	Krasno-bród, Poland		468-473
[Pub122]	IX Konferencja Naukowa „Światłowodowy i ich zastosowania”	J.Kruszewski, M.Bebłowska M.Borecki,	Projektowanie i wykonanie asymetrycznego sprzęgacza optycznego z włókien polimerowych	Krasno-bród, Poland		596-602
[Pub123]	IX Konferencja Naukowa „Światłowodowy i ich zastosowania”	J.Kruszewski, M.Bebłowska M.Borecki	Przegląd zastosowań optycznych włókien polimerowych w czujnikach	Krasno-bród, Poland		603-608

[Pub124]	Joint Workshop of the Thematic Networks PVNET, PV-EC-NET and PV-NAS-NET and the European Photovoltaic Industry Association EPIA, Towards a Shared European Vision on the Future of PV Research, Market, Industry and Policy	S.M.Pietruszko	PV in Newly Associated States	Ljubljana, Slovenia		
[Pub125]	Letnia Szkoła Mikrotechnologii	S.M.Pietruszko	Fotowoltaika: ogniwa i systemy	Łódź, Poland		
[Pub126]	Mat. 50-tego Otwartego Seminarium z Akustyki	M.Baszun et. al.	Chemosensory z akustyczną falą powierzchniową do pomiaru stężeń par rozpuszczalników organicznych	Gliwice, Poland	1	
[Pub127]	Mat. II Krajowa Konferencja Elektroniki – KKE’2003	J.Szmidt, A.Werbowy, A.Jakubowski, L.Lukasiak	Materiały i technologie dla systemów mikroelektronicznych i optoelektronicznych	Kołobrzeg, Poland	1	65-72
[Pub128]	Mat. II Krajowa Konferencja Elektroniki – KKE’2003	M.Sochacki, M.T.H.Aung, J.Szmidt, Z.Lisik	SiC – stan obecny, perspektywy rozwoju	Kołobrzeg, Poland	1	115-120
[Pub129]	Mat. II Krajowa Konferencja Elektroniki – KKE’2003	M.Śmietana, J.Kalenik	Głowica światłowodowego czujnika zmian współczynnika załamania lub poziomu cieczy oparta na światłowodzie grubordzeniowym	Kołobrzeg, Poland	2	487-492
[Pub130]	Mikrosymposium Tematyczne IChF PAN – „Perspektywy odnawialnych źródeł energii”	S.M.Pietruszko	Perspektywy rozwoju fotowoltaiki	Warsaw, Poland		
[Pub131]	P.M.A.Sloot et al.(eds.): ICCS 2003, Springer-Verlag	M.Langer, Z.Lisik, E.Raj, N.K.Kim, J.Szmidt	Simulations for thermal analysis of MOSFET IPM using IMS substrate			636-643
[Pub132]	P.M.A.Sloot et al.(eds.): ICCS 2003, Springer-Verlag	M.Langer, Z.Lisik, E.Raj, N.K.Kim, J.Szmidt	Dynamic simulations for thermal analysis of MOSFET IPM on IMS substrate			644-649
[Pub133]	Proceedings of SPIE	A.Mossakowska-Wyszyńska, R.Paszkievicz, P.Szczepański	Dynamic operation of planar circular grating DFB/DBR laser with phase shift	USA	4829	709-711
[Pub134]	Proceedings of SPIE	R.Paszkievicz, A.Tyszka-Zawadzka, P.Szczepański	Effect of excess quantum noise on output power in planar circular grating DBR laser with integrated outcoupler	USA	4829	691-692
[Pub135]	Proceedings of SPIE	M.Borecki,	Intelligent fibre optic sensor head working condition analysis	USA	5028	146-149
[Pub136]	Proceedings of SPIE	M.Borecki, J.Kruszewski	The new method of analysis of fibre optics GRIN devices	USA	5064	241-244
[Pub137]	Proceedings of SPIE	J.Kruszewski, M.Bebłowska, M.Borecki	Fibre optic nephelometr	USA	5064	128-131
[Pub138]	Proceedings of SPIE	M.Borecki, J.Kruszewski	Intelligent fiber optic sensor for solution concentration examination	USA	5124	49-54
[Pub139]	Proceedings of SPIE	R.Kisiel	Lead-free technologies for electronic equipment assembly	USA	5125	348-353
[Pub140]	Proceedings of SPIE	T.M.Adamowicz	Study of lasing and discharge plasma parameters in noble gas – metal atom mixtures	USA	5230	155-163

[Pub141]	Proceedings of SPIE	P.Czuma, P.Szczepański	Gain Enhancement in One-dimensional Crystal with Photonic Bandgap	USA	5230	17-21
[Pub142]	Proceedings of SPIE	W.Kamiński, J.Kęsik, W.Woliński	A new design of an ion argon laser discharge tube	USA	5230	174-178
[Pub143]	Proceedings of SPIE	M.Malinowski, R.Piramidowicz, W.Woliński	Solid-state laser materials for ultraviolet wavelengths	USA	5230	13-16
[Pub144]	Proceedings of SPIE	A.Mossakowska - Wyszyńska, A.Przybysz, P.Szczepański	Light generation in planar waveguide DFB and F-P lasers with photonic crystal	USA	5230	143-148
[Pub145]	Proceedings of SPIE	R.Paszkievicz, A.Tyszka-Zawadzka, P.Szczepański	Effect of excess quantum noise in CG-DFB laser with external outcoupler	USA	5230	82-86
[Pub146]	SEFI Annual Conference Porto 2003	B.Galwas	Structure and tools of contemporary multimedia book	Porto, Portugal		
[Pub147]	SEFI Annual Congress Walencja, Hiszpania	B.Galwas	Virtual University of Technology - New Initiative of Group of Technical Universities in Poland	Walencja, Spain		
[Pub148]	Structures - Waves - Human Health	M.Baszun et. al.	Radiation of Cellular Telephony BTS in Aspect of Environment Protection		12	91-100
[Pub149]	Structures - Waves - Human Health	M.Baszun et. al.	The Analysis of SAW Modes Induced by IDT on the Monocrystalline Substrates		12	123-132
[Pub150]	Summer School: Technology of carbon surface	M. Słapa, J. Szmidt, A.Szczęsny, P.Śniecikowski, W.Czarnecki, M.Dudek, M.Traczyk, A.Werbowy	Detectors with ultra-thin NDC layers	Łódź/ Szklarska Poręba/ Liberec		
[Pub151]	Summer School: Technology of carbon surface	M.Śmietana, J.Szmidt, M.Dudek, P.Niedzielski	Optical properties of diamond-like clad for optical fibres	Łódź/ Szklarska Poręba/ Liberec		
[Pub152]	Summer School: Technology of carbon surface	J.Szmidt, R.Gronau	Shallow plasma ion implantation of carbon into silicon substrate	Łódź/ Szklarska Poręba/ Liberec		
[Pub153]	Summer School: Technology of carbon surface	P.Śniecikowski, A.Szczęsny, J.Szmidt, A.Werbowy	Reactive ion etching of compound semiconductors – GAN and SiC	Łódź/ Szklarska Poręba/ Liberec		
[Pub154]	Summer School: Technology of carbon surface	T.Guzdek, J.Szmidt, M.Dudek, P.Niedzielski	Chemosensor with NCD dielectric layer as open gate in CHEMFET	Łódź/ Szklarska Poręba/ Liberec		
[Pub155]	Symposium Techniki Laserowej STL, Komunikaty Supplement	J.Sarnecki, K.Kopczyński, M.Malinowski	Epitaksjalne lasery falowodowe Yb,Nd:YAG do włóknowych wzmacniaczy prazeodymowych	Szczecin, Poland		
[Pub156]	ULSI 2003 4 th European Workshop on Ultimate Integration of Silicon	B.Majkusiak	Theoretical Modeling of the Double Gate MOS Resonant Tunneling Diode	University of Udine		147-150
[Pub157]	VIIth International Conference CADSM'2003	A.Jarosz, A.Pfützner	Geometric dependencies of parasitic capacitances in interconnection buses	Lviv – Slavsko, Ukraine		286-289
[Pub158]	VIIth International Conference CADSM'2003	G.Janczyk	SOI-MOSFET's body potential: floating or fixed?	Lviv – Slavsko, Ukraine		63-65
[Pub159]	Workshop PV-EC-NET & PV-NAS-NET, EPIA	S.M.Pietruszko	First Steps Towards PV Roadmap in NAS	Bruksela, Belgium		

[Pub160]	XI Konferencja „Sieci i Systemy Informatyczne”	B.Galwas, R.Rak	The new Web-Based Model of Undergraduate Engineering Studies Developed by WUT	Łódź, Poland		
[Pub161]	XVII Szkoła Optoelektroniki – „Fotowoltaika – ogniwa słoneczne i detektory”	S.M.Pietruszko	Fotowoltaika w Polsce i na świecie	Kazimierz, Poland		

6.4. Scientific and Technical Books

Number	Authors	Publisher	Title, volume, pages
[Pub162]	T.M.Adamowicz	Oficyna Wydawnicza Politechniki Warszawskiej	Diagnostyka ośrodków laserowych i wyładowczych na mieszaninach gazów szlachetnych i par metali, Prace Naukowe PW seria Elektronika z 146, 126 p.
[Pub163]	B.Galwas, J.K.Piotrowski, P.Witoński, J.Skulski, J.Dawidczyk, M.Pajer, M.Plebańska	Ośrodek Kształcenia na Odległość OKNO PW	Podstawy Techniki W. Cz.
[Pub164]	M.Malinowski	Oficyna Wydawnicza Politechniki Warszawskiej	Lasery światłowodowe, 208 p.
[Pub165]	P.Szwemin	Oficyna Wydawnicza Politechniki Warszawskiej	Modelowanie przepływu gazu w układach wzorców wysokich próżni, Prace Naukowe, Seria „Elektronika” z. 148, p. 206
[Pub166]	P.Witoński, R.Piramidowicz	Ośrodek Kształcenia na Odległość OKNO PW	Informatyka 6 – Programowanie obiektowe, Seria: Akademickie Podręczniki Multimedialne

7. REPORTS

- [Rep1] **Design methodology of analog ASICs based on the notion of virtual prototyping** (Metodologia projektowania analogowych układów ASIC oparta na koncepcji wirtualnego prototypowania), project leader: Zbigniew Jaworski
- [Rep2] **Determination of UV light generation conditions in active Nd³⁺ doped fibres** (Określenie warunków generacji promieniowania z zakresu ultrafioletu w światłowodach aktywnych domieszkowanych jonami Nd³⁺), project leader: Ryszard Piramidowicz
- [Rep3] **Development of a microscopic image analysis system for medical images** (Integracja systemu do analizy obrazów mikroskopowych), project leader: Hanna Górkiewicz-Galwas
- [Rep4] **Elaboration of the methodology of characterisation of PV systems** (Charakteryzacja metod pomiarowych stosowanych w badaniach systemów fotowoltaicznych) project leader: Stanisław M. Pietruszko
- [Rep5] **ENERBUILD—Network Energy in the Built Environment** (Sieć Energia w Budownictwie), project leader: Stanisław M. Pietruszko
- [Rep6] **High beam quality UV lasers for microelectronics** (Opracowanie ultrafioletowych laserów generujących wysokiej jakości wiązki promieniowania dla zastosowań w mikroelektronice), project co-director: Tadeusz M. Adamowicz
- [Rep7] **Image and object parameters for visual information retrieval systems** (Wyszukiwanie parametrów obrazów i obiektów na obrazach dla potrzeb bazy danych fotografii cyfrowej), project leader: Grzegorz Kukielka
- [Rep8] **Investigating of the influence of small hydrogen content on the transport parameters of charge carriers in amorphous silicon** (Badanie wpływu małych zawartości wodoru na parametry transportu krzemu amorficznego), project leader: Stanisław M. Pietruszko
- [Rep9] **Investigation and realisation of Intelligent fibre optic sensor for solution concentration examination** (Opracowanie i wykonanie modelu inteligentnego czujnika światłowodowego do badania stężeń roztworów), project leader: Jerzy Kruszewski
- [Rep10] **Investigation of planar waveguide Yb³⁺:YAG/YAG laser** (Opracowanie i zbadanie planarnego lasera światłowodowego Yb³⁺:YAG/YAG), project leader: Michał Malinowski
- [Rep11] **Measurements of the complex permittivity of single crystal oxides and software development for automation of measurement of insertion loss vs. frequency dependence for SAW delay lines** (Badania zespolonej przenikalności elektrycznej monokryształów tlenkowych oraz opracowanie oprogramowania do automatycznych pomiarów charakterystyk częstotliwości linii opóźniających APF), project leader: Jerzy Krupka
- [Rep12] **Measuring system of liquid viscosity with using of piezoceramic ultrasonic transducers** (System pomiarowy lepkości cieczy z wykorzystaniem piezoceramicznych przetworników ultradźwiękowych) project leader: Jerzy Krupka
- [Rep13] **Microsystems - construction, technology, design. Humidity sensor based on silicon** (Mikrosystemy – konstrukcje, technologie, projektowanie. Czujnik wilgotności w oparciu o strukturę krzemu porowatego), project leader: Romuald B. Beck
- [Rep14] **Modelling and investigation of physical phenomena in low-dimensional nanoelectronic MOS and MOS SOI structures** (Modelowanie i badanie zjawisk fizycznych w nanoelektrycznych strukturach niskowymiarowych MOS i MOS SOI) project leader: Bogdan Majkusiak
- [Rep15] **Modelling and investigation of waveguide laser structures** (Modelowanie i badanie światłowodowych struktur laserowych), project leader: Michał Malinowski
- [Rep16] **Modelling of transport phenomena and electrical characteristics of the MOS and MOS SOI tunnel devices** (Modelowanie zjawisk transportu i charakterystyk elektrycznych przyrządów tunelowych MOS i MOS SOI), project leader: Bogdan Majkusiak
- [Rep17] **Nanocrystalline boron nitride (BN) films for microelectronic applications – deposition and characterization** (Warstwy nanokrystalicznego azotku boru (BN) dla aplikacji mikroelektrycznych - wytwarzanie i charakteryzacja), project leader: Aleksander Werbowy
- [Rep18] **Nanoelectronic test structures** (Struktury testowe dla nanoelektroniki), project leader: Romuald B. Beck
- [Rep19] **New active planar photonic band-gap structures** (Nowe aktywne struktury planarne z foniczne przerwą zabronioną), project leader: Paweł Szczepański
- [Rep20] **New and improved methods of simulation of manufacturing processes in microelectronics and modeling of IC devices** (Nowe i ulepszone metody symulacji procesów produkcyjnych mikroelektroniki i elementów układów scalonych), project leader: Wiesław Kuźmich
- [Rep21] **Novel dielectric layers for silicon carbide preserving their properties at elevated temperatures** (Nowe dielektryczne warstwy na węglu krzemu zachowujące swoje właściwości w podwyższonych temperaturach), project leader: Jan Szmidt
- [Rep22] **Operating conditions analysis of the transistor oscillator coupled with the photovaractor** (Analiza warunków pracy oscylatora tranzystorowego sprzężonego z fotowaraktorem), project leader: Bogdan Galwas
- [Rep23] **Optimization of construction and technology of ion argon laser discharge tube** (Optymalizacja konstrukcji i technologii wykonania ceramiczno-metalowej rury wyladowczej jonowego lasera argonowego), project leader: Jerzy Kęsik
- [Rep24] **Plasma assisted etching (RIE) of dielectric films for application in advanced microelectronic and nanoelectronic technologies** (Trawienia wspomagane plazmą (RIE) warstw dielektrycznych na potrzeby zaawansowanych technologii mikroelektrycznych i nanoelektrycznych), project leader: Jan Szmidt
- [Rep25] **Plasma deposited nanocrystalline boron nitride (BN) films for microelectronics – synthesis, characterization and applications** (Plazmowo wytwarzane warstwy nanokrystalicznego azotku boru (BN) dla zastosowań elektrycznych – synteza, charakteryzacja i aplikacje), project leader: Aleksander Werbowy
- [Rep26] **PV Centre - Photovoltaic Centre of Competence in Poland** (Fotowoltaiczne Centrum Doskonałości w Polsce), project leader: Stanisław M. Pietruszko

- [Rep27] **PV-EC-NET - Network for Co-ordination of European and National RTD Programmes for Photovoltaic Solar Energy** (Zespół do Koordynacji Europejskiego i Krajowych (Krajów UE) Programów Rozwoju Fotowoltaicznej Energii Słonecznej SPUB-M), project leader: Stanisław M. Pietruszko
- [Rep28] **PV-EC-NET - Network for Co-ordination of European and national RTD Programmes for Photovoltaic Solar Energy** (Koordynacja Europejskiego i Krajowych (Krajów UE) Programów Rozwoju Fotowoltaicznej Energii Słonecznej), project leader: Stanisław M. Pietruszko
- [Rep29] **PVNET - Photovoltaic Network** (Sieć fotowoltaiki SPUB-M.), project leader: Stanisław M. Pietruszko
- [Rep30] **PVNET - Photovoltaic Network** (Sieć fotowoltaiki), project leader: Stanisław M. Pietruszko
- [Rep31] **REASON (Research and Training Action for System on Chip Design)**, (Badania i szkolenia w zakresie projektowania systemów jednocukładowych) project co-ordinator: Wiesław Kuźmich
- [Rep32] **Researches on metal vapour - noble gas discharges for UV laser generation** (Badania wyładowań w mieszaninach gazów szlachetnych i par metali dla generacji laserowej w obszarze ultrafioletu), project leader: Tadeusz M. Adamowicz
- [Rep33] **Researches on stability and long-life performance of metal ion UV laser generation in noble gas – copper halide mixtures** (Badania nad zwiększaniem stabilności generacji i długowieczności ultrafioletowego lasera jonowego na mieszaninie neonu i halidków metali), project leader: Tadeusz M. Adamowicz
- [Rep34] **Silicon-germanium (SiGe) – material for new generation CMO devices** (Krzemogerman (SiGe) – materiał dla przyrządów CMOS następnej generacji), project leader: Małgorzata Jurczak
- [Rep35] **Studies on monitoring procedures of autonomous PV systems** (Opracowanie procedur monitorowania autonomicznych systemów fotowoltaicznych), project leader: Stanisław M. Pietruszko
- [Rep36] **Test structures for nanoelectronics** (Struktury testowe dla nanoelektroniki), project leader: Romuald B. Beck
- [Rep37] **The determination of the gas state parameters in the dynamic gas expansion calibration system based on the idea of global correction factor** (Wyznaczanie parametrów stanu gazu w układzie wzorca próżni z dynamiczną ekspansją gazu, w oparciu o koncepcję globalnego współczynnika korekcyjnego), project leader: Piotr Szwemin
- [Rep38] **The implementation of the distributed Monte-Carlo computation scheme to determination of the gas state parameters in the metrological systems** (Obliczenia rozproszone w zastosowaniu do wyznaczania parametrów układów metrologicznych metodą Monte-Carlo), project leader: Piotr Szwemin
- [Rep39] **The method development for projecting optoelectronics and photonics microsystem** (Rozwój metod projektowania konstrukcji i badania mikrosystemów optoelektronicznych oraz fotowoltaicznych), project leader: Jerzy Kruszewski
- [Rep40] **Tunable filters based on dielectric resonators TUF** (Przestrajalne filtry oparte na rezonatorach dielektrycznych), project leader: Jerzy Krupka
- [Rep41] **Ultrathin SiO₂ and high-K dielectric layers for next generation ICs** (Ultracienkie warstwy SiO₂ oraz dielektryki o wysokiej przenikalności elektrycznej dla układów scalonych nowej generacji), project leader: Andrzej Jakubowski
- [Rep42] **Visual queries for image database systems – methods and algorithms development** (System wyszukiwania treści obrazowych w fotograficznych bazach danych - rozwój metod oraz narzędzi algorytmicznych i programowych), project leader: Grzegorz Kukielka

8. PATENTS

- [Pat1] Jerzy Kęsik, Wojciech Kamiński, **The ion gas laser discharge tube** (Rura wyładowcza jonowego lasera gazowego) (patent: P356256)
- [Pat2] Jerzy Kalenik, Mateusz Śmietana, **Waveguide sensor head** (Głowica czujnika światłowodowego) (patent: P359259; notified: 20 March 2003)

9. CONFERENCES, SEMINARS AND MEETINGS

9.1. International Conferences

- [Con1] **1st SWH International Conference Solar-Wind-Hydrogen/Fuel Cells – (Renewable Energies)**, Segovia, Spain, July 7-10
reporter: S.M.Pietruszko
- [Con2] **2nd International Conference on Multimedia and ICTs in Education (m-ICTE2003)**, Badajoz Spain, December 2-3
reporter: B.Galwas
- [Con3] **3rd International Economic Congress Opportunities of Change**, Sopot, Poland, July 3-6
reporter: M.Baszun
- [Con4] **4-th Electronic Circuits and Systems Conference – ECS*2003**, Bratislava, Slovakia, September 11-12
tutorial lecturer: W. Pleskacz
speaker: W. Kuźmich
- [Con5] **5th Intern.Conf. Thermal Problems in Electronics – Microtherm 2003**, Łódź, Poland, June 30 – July 2
reporters: E.Dusiński, P.Śniecikowski, J.Szmidt, K.Klimczak, M.Sochacki, A.Werbowy, A.Kolendo, P. Firek, J.Szmidt, M.T.Htun Aung

- [Con6] **6-th International Workshop on Electronics, Control, Measurement and Signals – ECMS’2003**, Liberec, Czech Republic, June 2-4
tutorial lecturer: W. Pleskacz
- [Con7] **6th Symposium “Diagnostics and Yield – Advanced Silicon Devices and Technologies for ULSI Era”**, Warsaw, Poland, June 22 – 25
reporters: T.Bieniek, R.B.Beck, A.Jakubowski, M.Cuch, A.Wojtkiewicz, M. Sochacki, A.Kolendo, J. Szmidi, A. Werbowy, L.Łukasiak, Z.Pióro, J.Walczak, B.Majkusiak
- [Con8] **7-th International Conference: “The Experience of Designing and Application of CAD Systems in Microelectronics” – CADSM’2003**, Lvov-Slavsko, Ukraine, February 17-22
tutorial lecturer: W. Pleskacz
speaker: W. Kuźmicz
program committee members: W.Kuźmicz, W. Pleskacz
- [Con9] **8th European Vacuum Conference and 2nd Annual Conference of the German Vacuum Society**, Berlin, Germany, June 23 – 26
reporters: A.Werbowy, J.Szmidi, P.Szwemin, M.Niewiński
- [Con10] **10th International Conference MIXDES Mixed Design of Integrated Circuits and Systems**, Łódź, Poland, June 26-28
reporters: A.Łuczyk, W.Pleskacz
speakers: G.Janczyk, Z. Jaworski, W. Kuźmicz, E. Piwowarska
program committee members: W.Kuźmicz, A.Pfítzner
organizing committee member: W.Kuźmicz
- [Con11] **10th International Topical Meeting on Optics of Liquid Crystals**, Aussois, France, September 13-19
reporters: J.Parka, T.Grudniewski
- [Con12] **13th Bi-annual Conference Insulating Films on Semiconductors INFOS’2003**, Barcelona, Spain, June 18-20
reporter: B.Majkusiak
- [Con13] **14th European Conf. On Diamond , Diamond-like Materials, Carbon Nanotubes, Nitrides & Silicon Carbide – DIAMOND-2003**, Salzburg, Austria, September 7-12
reporters: J. Szmidi, A. Werbowy
- [Con14] **18th IEEE International Symposium on Defect and Fault Tolerance in VLSI Systems – DFT’03**, Cambridge, MA, USA, November 3-5
program committee member: W. Pleskacz
- [Con15] **27th International Conference and Exhibition IMAPS-Poland**, Podlesice, Poland, September 16-19
reporters: Z.Szczepański, J.Kalenik, R.Kisiel
- [Con16] **CLEO/Europe-EQEC**, Munich, Germany June 22-27
reporters: T.Kossek, P.Szczepański, W.Kamiński
- [Con17] **Conference „Elektronika 2003“**, Sozopol, Bulgaria, September 24
speaker: W. Kuźmicz
- [Con18] **East-West Design & Test Conference – EWDTC’2003**, Yalta-Alushta, Ukraine, September 17-21
speaker: W. Kuźmicz
tutorial lecturer: W. Pleskacz
session chairman: W. Kuźmicz, W. Pleskacz
organizing committee member: W. Kuźmicz
- [Con19] **EURESCO Conference „Photovoltaics and Environment,”** Granada, Spain, November 7-12
reporters : S.M.Pietruszko, A.Kozłowski, W.Pietnoczka
- [Con20] **European Materials Research Society, EMRS-2003, Fall Meeting**, Warsaw, Poland, September 15-19
reporters: A.Werbowy, J.Szmidi, R.B.Beck, A.Jakubowski
- [Con21] **INFOS 2003 Insulating Films Semiconductors**, Barcelona, Spain, June 18-20
reporter: B.Majkusiak
- [Con22] **International Symposium of 50th Anniversary of the Death of prof. dr Jan Czochralski**, Toruń, Kcynia, Poland, April 26-27
reporters: M.Nakielska, M.Malinowski
- [Con23] **ISES Solar World Congress 2003**, Goeteborg, Sweden, June 14-19
reporters: S.M.Pietruszko, A.Mikołajuk, M.Gładzki, A.Patryn
- [Con24] **SEFI Annual Conference Porto 2003**, Porto, Portugal, September 7-10
reporter: B.Galwas
- [Con25] **XV Conference on Liquid Crystals: Chemistry, Physics and Applications**, Zakopane, Poland, October 13-17
reporters: J.Parka, T.Grudniewski

9.2. Local Conferences

- [Con26] **II Krajowa Konferencja Elektroniki –KKE’2003**, Kołobrzeg, June 9 – 12,
reporters: J.Szmidi, A.Werbowy, A.Jakubowski, L.Łukasiak, M.Sochacki, M.T.H.Aung, M.Śmietana, J.Kalenik
- [Con27] **II Krajowa Konferencja Naukowo-Techniczna „Tanie ciepło dla budownictwa mieszkaniowego,”** Wrocław, April 25
reporter: S.M.Pietruszko

- [Con28] **III Konferencja i Warsztaty „Uniwersytet Wirtualny: model, narzędzia i praktyka,”** Warszawa, June 5-7
reporter: B.Galwas
- [Con29] **IX Konferencja Naukowa „Światłowodowy i ich zastosowania,”** Krasnobród, October 9-11
reporters: A.Mossakowska-Wyszyńska, P.Czuma, P.Szczepański, R.Paszkiwicz, K.Leśniewska-Matys, M.Borecki, J.Kruszewski, M.Bebłowska

9.3. Schools, Seminars and Meetings

- [Con30] **10th International Topical Meeting on Optics of Liquid Crystals,** Aussois, France, September 13-19
reporters: J.Parka, T.Grudniewski
- [Con31] **Co-operation exchange „Renewable Energy” with Central and Eastern European countries,** Wien, Austria, December
reporters: A.Leś, K.Ziemlicki
- [Con32] **Device DFT Course – ”Techniques For Designing Testable ICs: Internal Scan, BIST, Boundary Scan And SOC Techniques”**, Tallin, Estonia, October 8-10
audience: W.Pleskacz, A.Wielgus
- [Con33] **E-CORE Workshop FP6 & Construction Research in the Enlarged European Union,** Warsaw, Poland, November 6-7
speaker: S.M.Pietruszko
- [Con34] **E-MRS 2003 Spring Meeting,** Strasbourg, France, June
speaker: S.M.Pietruszko
- [Con35] **Faculty seminar: Programy badawcze Unii Europejskiej: Start 6 Programu Ramowego,** January 6
speakers: W.Kuźmicz, A.Trębicki
audience: A.Pfitzner, A.Mossakowska-Wyszyńska, P.Szwemin, R.Kisiel
- [Con36] **Fall School „Self-organizing systems - Algorithms and hardware implementation”,** Sinaia, Romania, October 7
speaker: W.Kuźmicz
- [Con37] **IC Design with Cadence Tools Course,** Warsaw, Poland, September 16-19
speaker: Z.Jaworski
- [Con38] **Institute seminar: Analiza ruchu obiektów przy wykorzystaniu metod wielowartościowej morfologii matematycznej,** April 24
speakers: G.Kukielka, J.Woźnicki, J.Parka
audience: A.Pfitzner, P.Szwemin, W.Pleskacz, J.Kruszewski, M.Malinowski, A.Szymańska, H.Górkiewicz-Galwas, J.Domański, T.Grudniewski, E.Piowarska, M.Grażdki, A.Mikołajuk, S.M.Pietruszko, K.Lachowska
- [Con39] **Institute seminar: Analiza właściwości wzorców wysokich próżni w oparciu o model symulacyjny,** November 13
speaker: M.Niewiński
audience: T.Adamowicz, Z. Szczepański, M.Borecki, E.Piowarska, A.Pfitzner, P.Szwemin
- [Con40] **Institute seminar: Elektronika od Chamonix do Jałty,** December 11
speaker: E.Piowarska, Z.Jaworski, W.Kuźmicz, W.Pleskacz,
audience: A.Pfitzner, P.Szwemin, A.Jakubowski
- [Con41] **Institute seminar: Fotonika mikrofalowa,** December 4
speaker: B. Galwas
audience: J.Lubacz, A.Pfitzner, P.Szwemin, M.Śmietana, J.Woźnicki, M.Malinowski, R.Piramidowicz, H.Górkiewicz-Galwas, J.Dawidczyk, P.Witoński, W.Pleskacz, K.Ołowski, P.Majchrzak, M.Rękas, Z.Mączyński
- [Con42] **Institute seminar: Konstrukcja, technologia, parametry rury wyładowczej jonowego lasera argonowego z kapilarą wyładowczą z węgla krzemu SiC,** February 14
speaker: W.Kamiński
audience: A.Jakubowski, R.Paszkiwicz, T.Adamowicz, W.Kwaśniewski, P.Warda, P.Szczepański, M.Nakielska, A.Wnuk, J.Kęsik, P.Szwemin, A.Mossakowska-Wyszyńska
- [Con43] **Institute seminar: Mechanizmy szybkiego prototypowania algorytmów CAD,** March 6
speaker: A.Kowalczyk
audience: Z.Jaworski, M.Sadowski, W.Kamiński, A.Jakubowski, W.Kuźmicz, E.Piowarska, A.Jarosz, G.Jańczyk, P.Szwemin
- [Con44] **Institute seminar: Mikroelektroniczne realizacje sterowników dla wszczepialnych urządzeń medycznych wykorzystujących logikę rozmytą,** January 9
speaker: W.Kuźmicz
audience: A.Pfitzner, J.Siwik, G.Jańczyk, A.Trębicki, R.Beck, M.Malinowski, A.Jakubowski, J.Szmidt, J.Kruszewski, M.Borecki, A.Jarosz, E.Piowarska, H.Górkiewicz-Galwas, J.Woźnicki, M.Tajchert, W.Pleskacz, K.Jasiński
- [Con45] **Institute seminar: Nowe materiały i zaawansowane technologie w montażu aparatury elektronicznej,** January 23
speakers: R.Kisiel, Z.Szczepański
audience: M.Malinowski, Z.Mączyński, P.Syrczyk, A.Ryter, P.Sałapski, R.Beck, J.Chojnowski, K.Bukat, J.Sitek, Ł.Siwiek, K.Szylko, J.Kalenik, J.Borecki, R.Biadań, P.Warda, A.Jasik, K.Lachowska, J.Siwik, E.Piowarska, S.Pietruszko, W.Pleskacz, J.Szmidt, J.Kruszewski, R.Piramidowicz

- [Con46] **Institute seminar:** Właściwości luminescencyjne cienkich, monokrystalicznych warstw epitaksjalnych z YAG:Pr³⁺, November 14
speaker: M.Nakielska
audience: W.Woliński, M.Malinowski, P.Warda, W.Kamiński, R.Piramidowicz, A.Mossakowska-Wyszyńska, J.Sarnecki, P.Czuma, T.Adamowicz, A.Wnuk, P.Szwemin, A.Pfitzner, P.Szczepański
- [Con47] **Institute seminar:** Wpływ nadmiarowego szumu kwantowego na statystyczne parametry promieniowania w laserach z rozłożonym sprzężeniem zwrotnym DBR/DFB z siatkami kołowymi o różnych konfiguracjach, February 14
speaker: R.Paszkiwicz
audience: W.Kwaśniewski, P.Warda, P.Czuma, M.Nakielska, A.Wnuk, M.Borecki, P.Wrzosek, W.Kamiński, M.Bugajski, P.Szwemin, P.Szczepański, A.Jakubowski, A.Mossakowska-Wyszyńska
- [Con48] **Institute seminar:** Zjawiska bipolarne w tranzystorach SOI-MOS, March 6
speaker: G.Jańczyk
audience: Z.Jaworski, M.Sadowski, W.Kamiński, A.Jakubowski, A.Szczęsny, W.Kuźmicz, E.Piwowska, A.Kowalczyk, P.Szwemin, L.Łukasiak
- [Con49] **IST-2000-30193 REASON Tutorial: Advanced Test Methods for Defect Testing**, Sofia, Bulgaria, October 24-25
speaker: W.Pleskacz
- [Con50] **Joint Workshop of the Thematic Networks PVNET, PV-EC-NET and PV-NAS-NET and the European Photovoltaic Industry Association EPIA, Towards a Shared European Vision on the Future of PV Research, Market, Industry and Policy**, Ljubljana, Slovenia, February
speaker: S.M.Pietruszko
- [Con51] **Letnia Szkoła Mikrotechnologii**, Łódź, Poland, September 24-26
speaker: S.M.Pietruszko
- [Con52] **Mikrosymposium Tematyczne IChF PAN – „Perspektywy odnawialnych źródeł energii”** Warsaw, Poland, December 9
speaker: S.M.Pietruszko
- [Con53] **MPSOC'03, 3rd edition of the International Seminar on Application-Specific Multi-Processor SoC**, Chamonix, France, July 7-11
audience: Z.Jaworski, E.Piwowska
- [Con54] **NAS Newly Associated States Enerbuild Workshop**, Warsaw, Poland, March 6-7 Marca
co-organizer: S.M.Pietruszko
- [Con55] **PV Contractors Meeting**, Ljubljana, Slovenia, October
speaker: S.M.Pietruszko
- [Con56] **REASON Summer School on FPGA-based and Re-configurable Systems**, Ljubljana, Slovenia, August 11-15
audience: Z.Jaworski, E.Piwowska
- [Con57] **Seminar at Polish Science and Technology Forum**, Paris, September 15
speakers: S.M.Pietruszko, W.Kuźmicz
- [Con58] **Seminar of Microelectronics and Nanoelectronics Group: Technika półprzewodnikowa dziś i jutro**, December 17
speaker: J.Rużyłło
audience: A.Pfitzner, P.Szwemin, W.Pleskacz, A.Jakubowski, W.Kuźmicz, E.Piwowska
- [Con59] **Summer School: Technology of carbon surface**, Łódź/Szklarska Poręba/Liberec, October 21-25
reporters: J.Szmidt, A.Szczęsny, P.Śniecikowski, A.Werbowy, M.Śmietana, R.Gronau, T.Guzdek
- [Con60] **Workshop PV-EC-NET & PV-NAS-NET, EPIA**, Brussel, Belgium, November
speaker: S.M.Pietruszko, A.Mikołajuk
- [Con61] **XVII Szkoła Optoelektroniki – „Fotowoltaika – ogniwa słoneczne i detektory”**, Kazimierz, Poland, October 13-16
speaker: S.M.Pietruszko
reporter: A.Mikołajuk

10. PRIZES

- [Prize1] Wiesław Kuźmicz, Medal of National Education Commission 2003
- [Prize2] A.Piwowska, B.Galwas, **Team Prize of Ministry of National Education and Sport 2003** for (Nagroda Zespołowa Ministra Edukacji Narodowej i Sportu za współautorstwo opracowania modelu i uruchomienia w Politechnice Warszawskiej Zaocznych Studiów Inżynierskich przez internet)