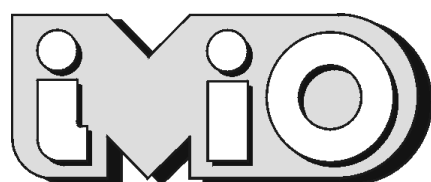




**INSTITUTE  
OF MICROELECTRONICS  
AND OPTOELECTRONICS**



**ANNUAL REPORT  
2001**

Edited by Agnieszka Mossakowska-Wyszyńska

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## From the Director

The Institute of Microelectronics and Optoelectronics was founded in 1970. It evolved from the Chair of Radio Engineering created by Professor Janusz Groszkowski in 1929. The Faculty of Electronics and Information Technology celebrated its Fifty Anniversary last year. Our Institute is bounded up with a cradle of the Faculty by the person of Professor Janusz Groszkowski who worked in IMiO until His last days of life, as well as by the territory - the "Building of Radio Engineering" (wing "A" of Building of Electro Engineering). A half of our Institute is situated in this building. Here, we develop Technology Centre of the Faculty and recently the newest equipment for plasma processes in completely modernised laboratory of semiconductor technology (clean room of class 1000) became fully operated.

This Annual Report summarises the research activities of the Institute in 2001, as well as the teaching activities in the academic year 2000/2001. 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.

Initiatives and creative efforts of the Institute's staff resulted in improvement of the research and teaching infrastructure and the research projects with significant value of (national and international) carried out in the Institute, as well as in valuable publications and individual successes. In my opinion, the most important occurrences in 2001 in the field of teaching organisation were: creation (together with Institute of Electronic Systems) of a new speciality "Electronics and Computer Engineering" on stationary studies and a speciality "Computer Engineering" in the field of distance learning - internet studies initiated and steered by Prof. Bogdan Galwas. I believe that concepts and curricula of these new teaching specialities 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. We developed the domain mentioned above in spite of obstacles caused by external situation, mainly by economical conditions. Thank you ver 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 2002

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 years the Institute has built up its competence in:

- modelling of physical effects in modern semiconductor devices;
- monocrystalline and amorphous 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;
- the construction and characterisation of optoelectronics elements and devices including fiber sensors;
- 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 like Inco Copernicus, Vilab Copernicus, ICOP-DEMO, Maria Curie Skłodowska, and NATO for peace.

The results of our scientific activities were published in many paper submitted to prestigious international scientific journals and presented on national and mostly on international conferences in the form of communications as well as the invited lectures. Our involvement in these projects together with a growing number of personal contacts with foreign scientists lead us to formal agreements on international scientific co-operation and participation in a number of international scientific joint projects.

### *1.2. Board of Directors*

#### **Director of the Institute**

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#### **Deputy-Director for Teaching Affairs**

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#### **Deputy-Director for Technical and Administrative Affairs**

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### 1.3. Microelectronics and Nanoelectronics Devices Division

#### Head of the Division

Andrzej Jakubowski, Ph.D., D.Sc. Tenured Professor  
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#### Senior academic staff

Romuald B. Beck, Ph.D., D.Sc.	Professor
Bogdan Majkusiak, Ph.D., D.Sc.	Professor
Jan Szmids, Ph.D., D.Sc.	Professor
Małgorzata Jurczak, Ph.D.	Assistant Professor
Lidia Łukasiak, Ph.D.	Assistant Professor
Zbigniew Pióro, Ph.D.	Assistant Professor
Andrzej Rosiński, Ph.D.	Assistant Professor
Jerzy Ruśyło, Ph.D., D.Sc.	Associate Professor
Sławomir Szostak, M.Sc.	Assistant Professor
Aleksander Werbowy, Ph.D.	Assistant Professor
Antoni Siennicki, Ph.D.	Senior Lecturer
Jan Gibki, Ph.D.	Lecturer
Józef Maciak, M.Sc.	Lecturer

#### Junior academic staff

Agnieszka Zarśba, M.Sc.	Assistant
Piotr Brzozowski, M.Sc.	Ph.D. Student
Tomasz Dźbski, M.Sc.	Ph.D. Student
Krzysztof Domański, M.Sc.	Ph.D. Student
Kamil Kosiel, M.Sc.	Ph.D. Student
Marek Kostana, M.Sc.	Ph.D. Student
Adam Linkowski, M.Sc.	Ph.D. Student
Maung Than Htun Aung, M.Sc.	Ph.D. Student
Jakub Walczak, M.Sc.	Ph.D. Student
Andrzej Wojtkiewicz, 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 of kinetics of silicon oxidation including low temperature plasma 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).

### 1.4. VLSI Engineering and Design Automation Division

#### Head of the Division

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#### Senior academic staff

Zbigniew Jaworski, Ph.D.	Assistant Professor
Mariusz Niewczas, Ph.D.	Assistant Professor
Elżbieta Piwowarska, Ph.D.	Assistant Professor
Witold Pleskacz, Ph.D.	Assistant Professor
Adam Wojtasik, Ph.D.	Assistant Professor
Andrzej Pfizner, Ph.D., D.Sc.	Senior Lecturer

#### Junior academic staff

Miroslaw Grygolec, M.Sc.	Assistant
Grzegorz Janczyk, M.Sc.	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 Kasproicz, M.Sc.	Ph.D. Student
Adam Lejman, M.Sc.	Ph.D. Student
Jacek Laskowski, M.Sc.	Ph.D. Student
Dariusz Sarna, M.Sc.	Ph.D. Student

#### Technical and administrative staff

Jerzy Gempel, M.Sc.  
Stanisław Jeszka, M.Sc.  
Marcin Sadowski, M.Sc.  
Andrzej Wulkanis, M.Sc.  
Andrzej Wielgus, 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

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#### Senior academic staff

Jerzy Piotrowski, Ph.D. Assistant Professor  
 Piotr Witoński, 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  
 Zenon Szczepaniak, M.Sc. Assistant, Ph.D. Student  
 Robert Rajkowski, M.Sc. Ph.D. Student  
 Jerzy Szyper, 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

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 Ryszard Kisiel, Ph.D. Assistant Professor  
 Krystyna Lachowska, Ph.D. Assistant Professor  
 Stanisław Pietruszko, Ph.D. Assistant Professor  
 Julitta Pogorzelska, Ph.D. Assistant Professor  
 Zbigniew Szczepański, Ph.D. Assistant Professor  
 Maria Bełłowska, Ph.D. Senior Lecturer

#### Junior academic staff

Agata Jasik, M.Sc. Ph.D. Student  
 Paweł Wrzosek, M.Sc. Ph.D. Student

#### Technical and administrative staff

Ryszard Biaduń,  
 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.

### 1.7. Optoelectronics Division

#### Head of the Division

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#### Senior academic staff

Paweł Szczepański, Ph.D., D.Sc.	Tenured Professor
Wiesław Woliński, Ph.D., D.Sc.	Tenured Professor
Tadeusz Adamowicz, Ph.D.	Assistant Professor
Jerzy Kśsik, 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
Krzysztof Dziściołowski, M.Sc.	Ph.D. Student
Marcin Kaczkan, M.Sc.	Ph.D. Student
Wojciech Kamiński, M.Sc.	Ph.D. Student
Tomasz Kossek, M.Sc.	Ph.D. Student
Monika Kowalska, M.Sc.	Ph.D. Student
Wojciech Kwaśniewski, M.Sc.	Ph.D. Student
Magdalena Nakielska, M.Sc.	Ph.D. Student
Robert Paszkiewicz, M.Sc.	Ph.D. Student
Konrad Świtalski, M.Sc.	Ph.D. Student
Artur Wnuk, M.Sc.	Ph.D. Student

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

### 1.8. Image Processing Division

#### Head of the Division

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#### Senior academic staff

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

#### Junior academic staff

Tomasz Grudniewski, M.Sc.	Assistant
Ryszard Pajśk, M.Sc.	Assistant

#### 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 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.

### *1.9. Vacuum Science and Technology Group*

#### **Head of the Group**

Piotr Szwemin, Ph.D.

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#### **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**

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#### **Senior academic staff**

Mikołaj Baszun, Ph.D.

Assistant Professor

Zdzisław Mśczeński, Ph.D.

Senior Lecturer

Janusz Rogowski, Ph.D.

Senior Lecturer

#### **Junior academic staff**

Dariusz Grzśda, 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**

<b>SPECIFICATION</b>	<b>2000</b>	<b>2001</b>	<b>DIFFERENCE</b>
<b>Academic staff</b>	81	86	+5
Tenured professors	5	5	0
Professors	6	6	0
Associate professors	0	0	0
Assistant professors	28	30	+2
Senior lecturers	8	8	0
Lecturers	2	2	0
Assistants and Ph.D. students	32	35	+3
<b>Technical staff</b>	16	15	-1
<b>Administrative staff</b>	5	6	+1
<b>Space</b>	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
<b>Computers</b>	256	280	+24
<b>Library resources</b>	9537	9563	+26
Books (number of volumes)	9537	9563	+26
Journals (number of titles subscribed to)	0	0	0
<b>Teaching activities</b>	61	62	+1
Basic courses	51	51	0
Advanced courses	8	9	+1
Special courses	2	2	0
International projects	0	0	0
<b>Research projects</b>	92	58	34
Granted by the University	56	28	-28
Granted by State Institutions	22	16	-6
Granted by International Institutions	7	11	+4
Other projects	7	3	-4
<b>Degrees awarded</b>	87	75	-12
D.Sc. degrees	0	0	0
Ph.D. degrees	3	4	+1
M.Sc. degrees	45	36	-9
B.Sc. degrees	39	35	-4
<b>Publications</b>	184	96	88
Sci.-tech. books	5	2	-3
Sci.-tech. papers in journals	25	44	+19
Sci.-tech. papers in conference proceedings	123	39	-84
Teaching aids	0	0	0
Other publications	31	11	-20
<b>Reports</b>	33	44	+11
Research reports	33	42	+9
Other reports	0	2	+2
<b>Patents</b>	2	1	-1
<b>Conferences</b>	143	155	+12
Organised by the Institute (number of conferences)	1	1	0
Organised by the Institute (number of participants)	19	13	-6
Others (number of conferences)	52	51	-1
Others (number of participants from the Institute)	71	90	+19

## 2. STAFF

### 2.1. Senior Academic Staff

- Tadeusz Adamowicz**, M.Sc. ('62), Ph.D. ('73), Quantum Electronics, Gas Discharges; room # 125 GR  
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Section at the Committee of Physics of the Polish Academy of Sciences ('94-), Member of e-mail: adamowicz@imio.pw.edu.pl  
IEEE ('97)
- Mikołaj Baszun**, M.Sc. ('69), Ph.D. ('77), Electronic Sensors, Assistant Professor, full time, room # 371 GE  
Characterization of Electronic Materials Group phone: 660-7908  
e-mail: baszun@imio.pw.edu.pl
- Maria Beblowska**, M.Sc. ('63), Ph.D. ('78), Optoelectronic Devices, Senior Lecturer, part room # 424 GR  
time, Optoelectronic and Hybrid Devices Division, Member of SEP Society of Polish phone: 660-7785  
Electricians ('80-) e-mail: beblowska@imio.pw.edu.pl
- Romuald B. Beck**, M.Sc. ('76), Ph.D. ('82), D.Sc. ('96), Microelectronics, Electronics, room # 336 GR  
Associate Professor, full time, Microelectronics and Nanoelectronics Devices Division, phone: 625-7329, 660-7534  
Leader of the Technology, Diagnostics and Modelling Group ('85-), Member of the fax: 625-73-29  
Microelectronics Section of the Electronics and Telecommunication Committee of the e-mail: beck@imio.pw.edu.pl  
Polish Academy of Sciences ('93-), Member of IEEE ('97-), Member of Electrochemical Society ('98-)
- Michał Borecki**, M.Sc. ('91), Ph.D. ('96), CAD, Optoelectronics, Assistant Professor, full room # 537 GR  
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Zenon Szczepaniak	M.Sc.	Assistant, Ph.D. Student	660-7907
Konrad Żwitalski	M.Sc.	Ph.D. Student	660-7246
Robert Rajkowski	M.Sc.	Ph.D. Student	660-7939
Paweł Wrzosek	M.Sc.	Ph.D. Student	660-7207
Artur Wnuk	M.Sc.	Ph.D. Student	660-5047
Andrzej Wojtkiewicz	M.Sc.	Ph.D. Student	660-7773
Agnieszka Zaręba	M.Sc.	Assistant	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
Jan Gutowski		Supply Manager	660-7708
Irena Guzewicz-śmiech		Secretary for Teaching	660-5349
Urszula Piotrkowicz		Accountant	660-7708
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
Magdalena Perzak		Administrative Clerk	660-7708
Jadwiga Radzyńska		Secretary	660-7777
Zbigniew Rudkowski		Senior Foreman	660-7908
Anna Sikorska		Finance Manager	660-7243
Krystyna Szyłko		Senior Foreman	660-7851
Andrzej śmiech	M.Sc.	Deputy-Director for Technical and Administrative Affairs	660-7777
Małgorzata Trzaskowska		Senior Technician	660-7534
Andrzej Wałkanis	M.Sc.	Senior Technician	660-7207
Andrzej Wielgus	M.Sc.	Scientific Specialist - technical	660-7207, 7819

### 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**, Kazimierz Gniadek
- [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] **Electronics 1** (Elektronika 1), **ELKA1**, Andrzej Jakubowski, Andrzej Pfitzner
- [Edu9] **Electronics 3** (Elektronika 3), **ELKA3**, Wiesław Kuźmicz
- [Edu10] **Fundamentals of Computer Science** (Podstawy technik komputerowych), **PTKO**, Michał Borecki
- [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] **Fundamentals of Solid State Electronics 2**, (Elektronika Ciała Stałego 2), **ELCS2**, Zdzisław Mączyński, Janusz Rogowski
- [Edu14] **Hardware Implementation of Algorithms in VLSI Circuits** (Sprzętowa implementacja algorytmów w układach VLSI), **SAV**, Elżbieta Piwowska
- [Edu15] **High Frequency Techniques** (Podstawy techniki w.cz.), **TWCZ**, Bogdan Galwas
- [Edu16] **Hybrid Integrated Circuits Technology** (Technologia hybrydowych układów scalonych), **THUS**, Zbigniew Szczepański
- [Edu17] **Integrated Optoelectronics** (Optoelektronika zintegrowana), **OZT**, Michał Malinowski, Agnieszka Mossakowska-Wyszyńska
- [Edu18] **Introduction to the UNIX System** (Użytkowanie systemu UNIX), **USUX**, Andrzej Wielgus
- [Edu19] **Laser Applications** (Zastosowania laserów), **ZLA**, Jerzy Kaşik
- [Edu20] **Laser Engineering** (Technika laserów), **TL**, Faculty of Applied Physics and Mathematics WUT, Tadeusz Adamowicz
- [Edu21] **Laser Physics** (Fizyka laserów), **FLA**, Paweł Szczepański
- [Edu22] **Laser Physics 2** (Fizyka laserów 2), **FL2**, Paweł Szczepański
- [Edu23] **Logic Circuits** (Układy logiczne), **UKLO**, Institute of Control and Computation Engineering WUT, Adam Wojtasik
- [Edu24] **Materials, Elements and Design of Electronic Equipment** (Materiały, elementy i konstrukcje), **MEiK**, Ryszard Kisiel
- [Edu25] **Materials, Elements and Design of Electronic Equipment 2** (Materiały, elementy i konstrukcje2), **MEiK2**, Ryszard Kisiel
- [Edu26] **Methods and Algorithms for Design Automation of VLSI circuits** (Metody i algorytmy automatyzacji projektowania struktur scalonych), **MAPS**, Adam Wojtasik
- [Edu27] **Microelectronics Development Trends** (Kierunki rozwoju mikroelektroniki), **KRM**, Andrzej Jakubowski
- [Edu28] **Microwave and Lightwave Integrated Circuits** (Mikrofalowe i optofalowe układy scalone), **MOUS**, Jerzy Piotrowski
- [Edu29] **Models and Systems of Image Processing** (Modele i systemy przetwarzania obrazów), **MSPO**, Jerzy Woźnicki
- [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] **Operating Systems 1** (Systemy operacyjne 1), **SOP1**, Andrzej Wielgus
- [Edu34] **Optowave Telecommunication** (Telekomunikacja optofalowa), **TEOP**, Bogdan Galwas
- [Edu35] **Photoelectric Phenomena in Semiconductors** (Zjawiska fotoelektryczne w półprzewodnikach), **ZFPP**, Stanisław Pietruszko
- [Edu36] **Photonics' Fundamentals** (Podstawy fotoniki), **FOT**, Michał Malinowski
- [Edu37] **Physical Fundamentals of Information Processing** (Fizyczne podstawy przetwarzania informacji), **FPPI**, Bogdan Majkusiak
- [Edu38] **Physics of Solid State** (Fizyka ciała stałego), **FCSR**, Jan Szmidt
- [Edu39] **Programming** (Programowanie), **PROG**, Adam Wojtasik, Marek Niewiański
- [Edu40] **Programming 8051 microcontroller** (Programowanie mikrokontrolera), **PMIK**, Lidia Łukasiak
- [Edu41] **Remote sensors** (Czujniki pól i parametrów ośrodków propagujących), **CPPO**, Mikołaj Baszun
- [Edu42] **Quality and Productivity Management** (Zarządzanie produktywnością i jakością), **ZPJ**, Julita Pogorzelska
- [Edu43] **Quality in Design and Manufacturing** (Jakość w procesach projektowania i wytwarzania), **JPPW**, Zdzisław Mączyński
- [Edu44] **Semiconductor Devices** (Przyrządy półprzewodnikowe), **PPR**, Andrzej Jakubowski
- [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 Kuśmierz
- [Edu55] **Digital Image Processing** (Cyfrowe przetwarzanie obrazów), **CPOO**, Jerzy Woźnicki
- [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**, Michał Malinowski
- [Edu59] **Physical Fundamentals of Nanoelectronics** (Podstawy fizyczne nanoelektroniki), **PFN**, Bogdan Majkusiak
- [Edu60] **Semiconductor Structures for VLSI and ULSI Circuits** (Struktury półprzewodnikowe dla układów VLSI i ULSI), **SPVU**, Andrzej Jakubowski

### 3.3. *Courses in English*

- [Edu61] **Electronics 1, EELE1**, Bogdan Majkusiak
- [Edu62] **Physics 3, A**, Bogdan Majkusiak

## 4. RESEARCH PROJECTS

Project definition and description prepared by Project Leaders.

### 4.1. Projects Granted by the University

- [Pro1] **The Development of Designing, Processing and Testing Methods of the Electronic Devices and Materials for Microelectronics and Optoelectronics** (Rozwój metod projektowania oraz wytwarzania i badania materiałów i przyrządów w dziedzinie mikroelektroniki i optoelektroniki), project leader: Andrzej Pfitzner, May 2000 - May 2001, **sub-projects:**
- [Pro1.1] **Analysis and investigations of oscillation conditions in microwave oscillators with photovaractor** (Analiza i badania warunków generacji oscylatorów mikrofalowych sprężonych z fotowaraktorem), sub-project leader: Bogdan Galwas  
The main topic of this project are the investigations of the new type of the optically controlled microwave devices - photovaractors. It covers both the measurements and the model extraction of the device. This model will allow to analyse the oscillation conditions and to design the optically controlled microwave oscillator.
- [Pro1.2] **Degradation Analysis of phenomena in ceramics with negative temperature coefficient of resistance** (Analiza zjawisk degradacyjnych w ceramice termistorowej z ujemnym temperaturowym współczynnikiem oporności), sub-project leader: Julitta Pogorzelska  
Work is devoted to defining of main causes deciding about degradation mechanisms in ceramics with spinel structure obtained from oxides of transient metals.
- [Pro1.3] **Digital image sequence segmentation for motion detection and analysis** (Segmentacja sekwencji obrazów cyfrowych na potrzeby detekcji i analizy ruchu) sub-project leader: Hanna Górkiewicz-Galwas  
The aim of that project is elaboration of the universal method of segmentation, which makes possible detection and investigation the moving objects on the basis of singular digital image and digital image sequence. The applied method concerning mathematical morphology gives bases to the analysis of structural features of objects. This method of segmentation is the closest to rules of functioning of the human perception system HVS.
- [Pro1.4] **Double insulating layers systems based on thin and ultrathin SiO<sub>2</sub> (fabrication and characterization)** (Układy podwójnych warstw dielektrycznych oparte na cienkich i ultracienkich warstwach SiO<sub>2</sub> (wytwarzanie i charakteryzacja)), sub-project leader: Romuald B. Beck, co-workers: Andrzej Jakubowski, Bogdan Majkusiak, Jan Szmidt, Tomasz Janik, Aleksander Werbowy, Lidia Łukasiak, Sławomir Szostak, Witold Ciemiewski, Kazimierz Dalbiak, Małgorzata Trzaskowska, Krzysztof Domański, Andrzej Wojtkiewicz  
Recent developments in MOSFET gate dielectric layers technology prove that the double insulating layers systems seem to be the only reasonable solution for the next generations of the ICs. Formation of the top insulating layers on the ultrathin one creates many technical and technological problems to be overcome. Also characterization techniques have to be adapted for such a case and carefully tested before utilising them for investigations. The aim of this work was to practically challenge these problems on both, technological and characterization levels.
- [Pro1.5] **Elaboration and investigation of fibre optic nephelometer.** (Opracowanie i badanie nefelometru światłowodowego), sub-project leader: Jerzy Kruszewski, co-workers: Maria Bełłowska, Michał Borecki  
The aim of the work is the elaboration of a fibre optic nephelometer (a scattering turbidimeter) for the use in monitoring system of the relative water turbidity. The fabricated model is designated to installation in washing machines or dish-washers.
- [Pro1.6] **Investigation of Flip Chip Joints Reliability** (Badania niezawodności połączeń struktur z kontaktami podwyższonymi), sub-project leader: Zbigniew Szczepański, co-workers: Ryszard Kisiel, Jerzy Kalenik, Krystyna Szyłko, Ryszard Biaduń,  
Over the past few years the most interest in packaging technology is focused on flip chip technology which enables highest interconnection density to obtain. In particular this technology has recently been expanded on polymer substrates.  
The main emphasis in these studies is focused on adhesive flip chip bonding on polymer substrate and underfilling process which increases long term joints reliability.  
Reliability of flip chip joints depends of several parameters. Some of them like substrate properties, adhesive properties and underfill material are taken into account in these studies.
- [Pro1.7] **Laboratory complex „Semiconductor Devices”** (Zespół laboratoriów „Przyrządy Półprzewodnikowe”), sub-project leader: Jan Szmidt, co-workers: Romuald B. Beck, Krzysztof Braclawski, Jan Gibki, Tomasz Janik, Małgorzata Jurczak, Andrzej Rosiński, Antoni Siennicki, Aleksander Werbowy, Agnieszka Zaręba, Józef Maciak  
The goal of the project is introduction of general changes to old variant of students' measurement laboratory and compilation of its new version. There will be prepared 10 new and modern laboratory exercises with new instruction manuals.
- [Pro1.8] **Methodology and software development for measuring systems of chosen properties of electronic materials** (Rozwój metodyki badań i oprogramowania systemów pomiarowych do badań wybranych właściwości materiałów elektronicznych), sub-project leader: Jerzy Krupka, co-workers: Zdzisław Mączyński, Janusz Rogowski, Mikołaj Baszun, Dariusz Grznda, Jerzy Rudkowski  
This work obeys:  
Characterization of microwave ferrites at cryogenic temperatures;  
Characterization of a new stoichiometric types of piezoceramics;  
Characterization of soft magnetic materials nonlinearities for ultralow frequencies.

- [Pro1.9] **Microelectronic SAW sensors** (Mikroelektroniczne czujniki z akustyczną falą powierzchniową), sub-project leader: Mikołaj Baszun, co-workers: Dariusz Grzda, Jerzy Rudkowski  
 This work obeys:  
 Working out the methods and computer program for design of sensors with dominant one of the three useful wave modes: Rayleigh mode, shear horizontal mode and/or acoustic plate mode;  
 Working out the methods and computer program for analysis of transmittance of SAW delay lines with arbitrary geometry of interdigital transducers.  
 These researches are planned to be continued in the next years, ending by production of some kinds of chemosensors.
- [Pro1.10] **Modeling and investigation of dielectric laser structure for visible wavelengths** (Modelowanie i badanie dielektrycznych struktur laserowych na zakres widzialny), sub-project leader: Michał Malinowski  
 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 laser materials. The significant interest in studying  $\text{Ho}^{3+}$ ,  $\text{Pr}^{3+}$  and  $\text{Tm}^{3+}$  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.
- [Pro1.11] **The development of computer program for simulation analysis of vacuum primary standards parameters.** (Opracowanie programu komputerowego do analizy układów metrologicznych o symetrii osiowej), sub-project leader: Piotr Szewmin, co-worker: Marek Niewiński  
 The goal of this project is to develop the computer program which allows: a) compose vacuum primary standards model from predefined elements such as gas source; cylindrical, conical, spherical pipes, diaphragms b) calculate orifice conductance basing on time of flight method c) calculate the gas density and angular distribution in vacuum systems. Program is employing Monte-Carlo simulation and using different kinds of random number generators.
- [Pro2] **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 Pfitzner, May 2001 - May 2002, **sub-projects:**
- [Pro2.1] **Analysis of working conditions and investigations of optically-switched microwave filters with the use of photovaractors** (Analiza warunków pracy i badania filtrów mikrofalowych przełączanych optycznie za pomocą fotowaraktora), sub-project leader: Bogdan Galwas, co-workers: Jerzy Piotrowski, Jerzy Skulski, Zenon Szczepaniak, Bożena Janus  
 The work is focused on development of optically-switched microwave filters with a new type of semiconductor optoelectronic device, which is a photovaractor. The investigations of optically-variable impedance of the photovaractors as well as elaboration of the small-signal model of the device are essential for proper designing of optically controlled microwave circuits. Experimental verification of this model can be conducted by designing of various optically-switched microwave pass-band filters.
- [Pro2.2] **Colour image segmentation – methods, range of application and quality of image segmentation assessment** (Segmentacja barwnych obrazów cyfrowych – metody, zakres zastosowań, kryteria oceny jakości segmentacji), sub-project leaders: Hanna Górkiewicz-Galwas, Grzegorz Kukiełka  
 The goal of this project is to investigate to what extent segmentation results based on grey-level information can be improved by using colour information. Because segmentation results of grey-level images might be negatively affected by the presence of intensity changes due to shadows we have investigated to what extent these segmentation results can be improved by using colour information. The influence of different colour systems will be examined, as well as new segmentation methods will be developed (for instance clustering and region growing algorithms).
- [Pro2.3] **Integrated Environment for VLSI Design** (Zintegrowane środowisko projektowania układów scalonych), sub-project leader: Wiesław Kuźmierz  
 This project aims at development of an environment integrating existing CAD tools for VLSI design (developed in the Institute of Microelectronics and Optoelectronics) with new Web-based design verification services („virtual IC prototyping” Web site also developed in the Institute of Microelectronics and Optoelectronics). The project includes creation of a design database management, design version control scheme, design integrity verification, scheduling of tasks and direct interaction with services available on the Web.
- [Pro2.4] **Investigation and modeling of nonlinear solid state laser media** (Modelowanie i badanie nieliniowych ośrodków czynnych laserów ciała stałego), sub-project leader: Michał Malinowski  
 Short wavelength operation of diode laser pumped solid state laser systems could be produced by using nonlinear techniques. Thus, harmonic generations in nonlinear crystals and frequency upconversion are two promising techniques. This program is related to the problem of self-frequency doubling in rare-earth activated nonlinear matrices. Optical and laser properties of  $\text{Pr}^{3+}$ ,  $\text{Dy}^{3+}$ ,  $\text{Tm}^{3+}$  and  $\text{Er}^{3+}$  doped lithium niobate ( $\text{LiNbO}_3$ ) crystals are investigated. Optical inhomogeneity and linewidths are studied by means of high-resolution laser spectroscopy and related to the matrix structure.
- [Pro2.5] **RIE of GaN layers in fluorine plasmas (technology and characterization)** (Trawienie warstw azotku galu w plazmie fluorowej (technologia i charakteryzacja)), sub-project leader: Romuald B. Beck, co-workers: Andrzej Jakubowski, Bogdan Majkusiak, Jan Szmidt, Tomasz Janik, Aleksander Werbowy, Lidia Łukasiak, Sławomir Szostak, Witold Ciemiewski, Kazimierz Dalbiak, Małgorzata Trzaskowska, Krzysztof Domański, Andrzej Wojtkiewicz and students  
 In all available techniques of GaN monocrystalline layer fabrication, a removal of topmost, defective layer is essential to obtain good, device quality material. The aim of this study was to examine feasibility of GaN layers etching by RIE in fluorine containing plasmas (less angerous and more stable than chlorine containing plasmas widely used for GaN etching).



- [Pro2.6] **The development of Moly Flow..er Plus program library for obtaining the total correction factor of vacuum primary standards.** (Opracowanie modułu współczynnika korekcji totalnej systemów metrologicznych dla programu Moly Flow ..er Plus), sub-project leader: Piotr Szwemin, co-worker: Marek Niewiński  
 During recent works based mainly on improving the accuracy of the continuous expansion system it was found that gas angular distribution (on the inlet to the gauge tubulation) is not the cosine, what is generally presumed. This effect can introduce large uncertainties. The goal of this project is to extend the Moly Flow..er Plus program possibilities to calculate the total corection factor whith will take into account effect discribed above. For this purpose the program will trace the paths of molecules in gauge tubulation eploying Monte-Carlo simulation method.
- [Pro2.7] **The micro-opto-mechanical vibration sensor** (Mikrooptoelektromechaniczny czujnik wibracji), sub-project leader: Jerzy Kruszewski, co-workers: Michał Borecki, Maria Bebłowska, P. Wrzosek.  
 An optical vibration sensor exploiting the modulation of power transmitted between optical fibers is elaborated. The modulation is achieved by masking of the receiving fiber from the emitted light beam by micro-machined cantilever. The study of cantilever material and sensor geometry is done by elaborated computer method.
- [Pro3] **The Development of Teleinformatics and Multimedia Methods and Tools for Education of Engineers** (Rozwój metod i narzędzi teleinformatycznych i multimedialnych w kształceniu inżynierów), project leader: Bogdan Galwas, January 2000 – December 2001  
 The main topic of this project is the preparation of the teaching materials for a few subjects e.g., mathematics, physics, circuits theory etc., as an internet off-line site on CDROMs. These materials will be used in extra-mural studies and later in the internet studies, so called "SPRINT". Additionally, an internet site "New Technologies in Education" is being prepared.
- [Pro4] **Aluminum nitride (AlN) passivation and protective layers for silicon carbide-based (SiC) Schottky diodes** (Pasywujące i zabezpieczające warstwy azotku glinu (AlN) dla diod Schottky'ego na węgliku krzemu (SiC)), project leader: Aleksander Werbowy, co-workers: Andrzej Jakubowski, Andrzej Olszyna, Jan Szmidt, Agnieszka Zarśba, Maung Than Htun Aung, Hubert Matysiak, June 2000 - May 2001  
 The goal of the project is evaluation of plasma deposited nanocrystalline AlN films as passivation and protective layers for SiC Schottky diodes. For this purpose I-V characteristics of SiC Schottky diodes with Ni contacts will be studied prior and after their passivation with AlN layers.
- [Pro5] **An arrangement for investigation of optoelectronic devices** (Stanowisko do badań układów optoelektronicznych), project leader: Jerzy Kruszewski, co-workers: Maria Bebłowska, Michał Borecki, June 2000 – May 2001  
 The laboratory set is destined for examination of optoelectronic devices in the range of 1.55 $\mu\text{m}$ . The arrangement is equiped with two laser diode source ( $\lambda_1 = 1.55\mu\text{m}$ . and  $\lambda_2 = 0.98\mu\text{m}$ ), that gives the possibility to investigate active fibres as well as fibre optic amplifiers system.
- [Pro6] **Directivity analysis for piezoelectric ultrasonic transducers** (Analiza charakterystyk kierunkowych promieniowania piezoelektrycznych przetworników ultradźwiękowych), project leader: Jerzy Krupka, co-workers: Mikołaj Baszun, Dariusz Grzędza, Jerzy Rudkowski, June 2000 – May 2001  
 This work obeys:  
 Precising of mathematical models for vibration analysis for transducers of an arbitrary shapes;  
 FEM analysis of surface vibrations;  
 Design of transducer shapes to obtain the best convergence of ultrasonic energy at the given remote object localization.
- [Pro7] **Investigation of degradation mechanism in thermistor ceramics with negative temperature coefficient** (Badanie mechanizmu degradacji ceramiki termistorowej z ujemnym temperaturowym współczynnikiem oporności), project leader: Julitta Pogorzelska, co-worker: Józef Maciak, June 2000 – May 2001  
 Phenomena observed during cyclic thermo-electrical burn –in process in NTC thermistors were investigated. It was demonstrated that thermal cycles have dominating influence on degradation process. It was stated that first part of degradation curve may be used for estimation of thermistor ceramic quality.
- [Pro8] **Investigation of the influence of phosphorous doping and hydrogen content on stability of amorphous silicon**(Badanie wpływu domieszkowania fosforem i zawartości wodoru na stabilność krzemu amorficznego), project leader: Stanisław Pietruszko, co-workers: Michał Urbański , Marek Kostana, Rafał Szczśniak, June 2000 – May 2001  
 The influence of phosphorous doping (range of  $10^{15} - 10^{21} \text{ cm}^{-3}$ ) done by ion implantation on stability of amorphous silicon is investigated. Additionally a-Si films are hydrogenated by ion implantation to achieve hydrogen content of 5 at.%. This project is directed at understanding the basic phenomena that limit the performance and reliability of thin-film amorphous solar cells.
- [Pro9] **Investigations of UV generation in a Ne-CuBr ion laser using a positive column discharge** (Badania warunków generacji w obszarze ultrafioletu w laserze jonowym Ne-CuBr wykorzystującym kolumnę dodatni wyładowania), project leader:Tadeusz M.Adamowicz, June 2000 – May 2001  
 Oscillation conditions on several UV 248 - 270 nm laser lines in neon - copper bromide mixtures are to be investigated in positive column (PC) discharges created in a long silica and ceramic tubes with a special copper diaphragms. Small-signal gain and output power are measured as functions of CuBr source temperature, intensity, duration and repetition rate of discharge current pulses.
- [Pro10] **Ion argon laser discharge tube technology** (Opracowanie technologii wykonania kapilary wyładowczej jonowego lasera argonowego), project leader: Jerzy Kśsik, co-worker: Piotr Warda, June 2000 – May 2001  
 The purpose of the project is execution of initial technology of silicon carbid laser discharge tube. The first problem is elaboration of SiC metalization to obtain the hard brazed SiC-Cu joints with a good quality and high thermal shock resistance. The another is solution of problem of TiC i B<sub>4</sub>C evaporation on SiC substrate to increase the ion sputtering resistance. The project results will make possible to construct the argon laser discharge tube with better output parameters in comparison of well known solutions.

- [Pro11] **Microelectronic structures with plasma deposited diamond films** (Mikroelektroniczne struktury z udziałem warstw diamentowych wytwarzanych w procesach plazmochemicznych), project leader: Jan Szmidt, co-workers: Aleksander Werbowy, Tomasz Guzdek, D. Kukla, Maung Than Htun Aung, June 2000 - May 2001  
The aim of the study is determination of technological process parameters allowing fabrication of MIS capacitors and transistors with nanocrystalline diamond (NCD) and diamond-like carbon (DLC) films. Plasma etching of films will be investigated as well as electrophysical parameters of produced structures.
- [Pro12] **Modeling and investigation of neodymium doped fiber laser** (Analiza pracy i badanie neodymowych laserów światłowodowych), project leader: Michał Malinowski, June 2000 – May 2001  
It was recently proved that lightwave circuits based on silica fibers offer an attractive and low-cost technology for both passive and active devices. One of the recent important developments is the successful operation of fiber amplifiers and lasers, which could be easily coupled to fiber components. In this work we present a general modeling of Nd-doped fiber laser. Approximate analytical results are derived for the threshold and the output intensities. Reasonable agreement between the experimental and model results are achieved for diode pumped Nd- doped silica fiber.
- [Pro13] **Modelling and verification of primary standards for high and ultra high vacuum** (Modelowanie i weryfikacja układów metrologicznych generujących niskie i bardzo niskie ciśnienia gazu) project leader: Piotr Szewmin, co-worker: Marek Niewiański, June 2000 – May 2001  
The main aim is to verify the parameters of vacuum primary standards with use of Monte-Carlo simulation. The calculation of real systems will be performed. The optimisation of blocking plate location will be undertaken. The conductance correction factor will be determined taking into account the gas density distribution.
- [Pro14] **Physical phenomena and devices of nanoelectronics** (Zjawiska fizyczne i przyrządy nanoelektroniki) project leader: Bogdan Majkusiak, co-workers: J. Walczak, K. Kosiel, June 2000 – May 2001  
The goal is a theoretical consideration and development of computer models of nanelectronic devices such as quantum point contact single-electron transistor, single-electron turnstile, as well experimental and theoretical investigation of MOS tunnel devices.
- [Pro15] **Real time analysis of blood-vessel structures in medical images** (Analiza struktur naczyń w obrazach medycznych w czasie rzeczywistym), project leader: H. Górkiewicz-Galwas, June 2000 – May 2001  
The main task of this work is development of earlier elaborated algorithms, which support the analysis of blood-vessel structures in medical images. To make the detection of new blood-vessel structures in real time possible, there were some attempts to use new multimedia VLIW architecture processor for image segmentation and texture analysis.
- [Pro16] **Simulation methods in designing and analysis of high vacuum systems.** (Metody symulacyjne w projektowaniu i analizie układów wysokiej i bardzo wysokiej próżni), project leader: Piotr Szewmin, June 2000-May 2001
- [Pro17] **Solid state lasers with  $\mu$ -size confined structures** (Badanie i modelowanie dielektrycznych mikrostruktur laserowych), project leader: Paweł Szczepański, June 2000 – May 2001  
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 is 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.
- [Pro18] **The light propagation method elaboration with include skew rays for bend optical fibres** (Opracowanie metody analizy propagacji światła z uwzględnieniem promieni skośnych w zakrzywionych włóknach optycznych), project leader: Michał Borecki, co-workers: Jerzy Kruszewski, Maria Bełłowska, June 2000 – May 2001  
The method of large core multimode optic fibre bend influence on its power transmission capabilities, based on NRT technique is elaborate. The novelty of this method is the use of Bezier's curve for description of the bend and introduction of skew rays into analysis. To determine the transmission parameters the Monte Carlo scheme was used. The results obtained by the authors indicate that the precision of the obtained results is influenced by two factors: the number of analysed rays according to Monte Carlo scheme, and the precision of bend description. When the convergence conditions are met, it shows that this method gives results in accordance with those obtained in experiments with multimode optic fibres.
- [Pro19] **Praseodymium doped fiber waveguide visible laser** (Model uaytkowy widzialnego lasera włóknowego aktywowanego jonami  $\text{Pr}^{3+}+\text{Yb}^{3+}$  pompowanej diodą laserową), project leader: Michał Malinowski, July 2000 – June 2001  
Diode pumped  $\text{Pr}^{3+}$  activated visible fiber laser is investigated. Single spatial mode laser diode is used as a pump source in double doped  $\text{Pr}^{3+}+\text{Yb}^{3+}$ :ZBLAN upconversion fiber laser. Lasing by upconversion means applying two infra red photons to a medium that responds by emitting one photon in the visible. Theoretical analysis and modeling of energy transfer processes in  $\text{Pr}/\text{Yb}$  double doped fiber lasers are performed.
- [Pro20] **Texture classification using local principle components analysis** (Klasyfikacja tekstur przy uayciu lokalnej analizy składowych głównych), project leader: Jerzy Woźnicki, July 2000 – June 2001  
Texture classification methods are used in many applications i.e. medical image analysis, multimedia data base searching, digital image segmentation and shape analysis. The LPCA classification is based on local subspaces. When the distance between measure vector and any of the local subspaces is minimum the LPCA algorithm marks out that subspace. The goal of this work is to compare properties of LPCA method with existing methods of texture analysis.

- [Pro21] **The functional model of intelligent liquid recognition sensor** (Model użytkowy inteligentnego czujnika rozpoznawania cieczy), project leader: Jerzy Kruszewski, co-workers: Maria Bebłowska, Michał Borecki, July 2000 – June 2001  
The work refers to the construction and working principles of intelligent sensor used for distinguishing water alcohol oil and oil modified samples. The sensor consists of intensity fibre head mounted on lift and computer measurement device with a detection block. The head works on the Fresnel reflection intensity basis and consists of the ending of large core polymer optical fibre. The optical signal from the head is converted in optoelectronics interface and feeding into detection block. The detection is based on the processed data feed on multilayer perceptron neural network. The sensor inelegance is effect of simultaneous indirect examination of different physical phenomenons. They occur during the head submerging, submersion, emerging and emergence in the detected medium.
- [Pro22] **Integrated signal discriminator for straw-based detectors used in high energy physics experiments** (Opracowanie scalonego układu odczytu danych z detektorów gazowych dla eksperymentów fizyki wysokiej energii), Institute of Microelectronics and Optoelectronics in the cooperation with Institute of Radioelectronics, project leader: Elżbieta Piwowarska, co-workers: Witold Pleskacz, Adam Jarosz, June 2001-May 2002  
The objective of this project is the electrical design and verification of the analogue integrated circuit to be used in the CERN experiments. The circuit is designed in BiCMOS AMS 0.8 um technology. The main requirements for the circuit are low-noise and high sensitivity.
- [Pro23] **Methods of the VLSI ICs Layout Analysis from the Manufacturability Point of View** (Metody analizy topografii układów scalonych VLSI z punktu widzenia produkowalności tych układów), project leader: Witold Pleskacz, June 2001-May 2002  
The main goal of the project is to write a monograph on VLSI ICs layout analysis methods from the manufacturability point of view. In this monograph the following research subjects will be included: layout-oriented manufacturing yield modeling, defect-based approaches to fault modeling, design for manufacturability of integrated circuits, and defect oriented testing methodologies.
- [Pro24] **Microelectronic SAW sensors** (Mikroelektroniczne czujniki z akustyczną falą powierzchniową), project leader: Mikołaj Baszun, co-workers: Dariusz Grzęda, Jerzy Rudkowski, June 2001-May 2002  
This work obeys: Working out the methods and computer program for design of sensors with dominating one of the three useful wave modes: Rayleigh mode, shear horizontal mode and/or acoustic plate mode; Working out the methods and computer program for analysis of transmittance of SAW delay lines with arbitrary geometry of interdigital transducers. These researches are planned to be continued in the next years, ending by production of some kinds of chemosensors. The design will be done, and practical examples of the delay lines will be made.
- [Pro25] **Porous silicon technology for applications in humidity sensors** (Technologia krzemu porowatego dla zastosowań w czujnikach wilgotności), 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, Krzysztof Domański, June 2001-May 2002  
Porous silicon allows construction of device that can be used as humidity sensor. The study of possible construction design and manufacturing of such devices are the main aim of this project. Particular attention is paid for the technology of optimum porous silicon structure formation.
- [Pro26] **Technological processes for silicon carbide – a novel material for microelectronics, optoelectronics and microsystems** (Procesy technologiczne węgla krzemu półprzewodnikowego materiału nowej generacji dla mikroelektroniki, optoelektroniki i mikrosystemów), project leader: Jan Szmidt, co-workers: Andrzej Jakubowski, Bogdan Majkusiak, Romuald B. Beck, Aleksander Werbowy, Agnieszka Zaręba, Maung Than Htun Aung, Tomasz Guzdek, Krzysztof Domański, June 2001 - May 2002  
The main goal of the project is development (on a laboratory scale) of basic processing methods of SiC substrates:  
-substrate pretreatment prior dielectric layers deposition,  
-deposition of oxide as well as nitride dielectric layers,  
-deep substrate etching in order to obtain MESA structures,  
-and subsequent fabrication and characterization of MIS capacitors on SiC.
- [Pro27] **The elaboration of optical fibre micro-switch with optic piezoelectric actuator** (Opracowanie piezoelektrycznego mikroprzełącznika światłowodowego), project leader: Jerzy Kruszewski, co-workers: Michał Borecki, Maria Bebłowska, P Wrzosek, June 2001-May 2002  
An optical moving mirror micro-switch is elaborated. The aim of this work is to study the lowest possible dimension of such a construction. The computer method of switch optic parameters modelling is developed. The results show that the micro-switch dimensions are bounded by actuator and collimating system.
- [Pro28] **Visible rare-earth doped fiber laser** (Analiza pracy, badanie i opracowanie widzialnego, światłowodowego lasera włóknowego), project leader: Michał Malinowski, June 2001-May 2002  
Generally, due to waveguide effect, resulting in strong optical field confinement, fiber lasers are several orders of magnitude more efficient than conventional lasers. They can be pumped by laser diodes and can easily operate in a single spatial mode. For these reasons fiber lasers can be considered as compact solid state lasers of high efficiency and good beam quality. This work is focused mainly in visible lasers because this region offers several challenges to the conventional systems. Our research is oriented to visible laser generation by using rare earth doped optical fibers as the active material. Especially, upconversion processes are investigated in Ho<sup>3+</sup> and Pr<sup>3+</sup> doped ZBLAN glasses. In frequency upconversion process energy of two or more IR photon is used to populate a high lying energy level of activator ion from which one-photon downconversion transition yield visible light. Thus, upconversion lasers generate radiation at wavelengths shorter than those of pumping sources.

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

- [Pro29] **Modelling And Characterization Of Quantum Effects In MOS SOI Devices** (Modelowanie i charakterystyka efektów kwantowych w przyrządach typu MOS SOI), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Bogdan Majkusiak, co-workers: Tomasz Janik, Andrzej Jakubowski, Jan Szmidt, Romuald B. Beck, Lidia Łukasiak, Agnieszka Zareba, Jakub Walczak, Kamil Kosiel, Antoni Siennicki, Józef Maciak, October 1998 - September 2001
- The purpose of the project is consideration of consequences of energy quantization and tunnelling effect on electrical characteristics of the metal-oxide-semiconductor devices fabricated in the silicon-on-insulator (SOI) technology. The detailed tasks are: developing a theoretical model of the MOS SOI tunnel diode, consideration of influence of semiconductor body thickness on tunnel current in MOS SOI tunnel diode and the gate and drain currents in MOS SOI transistor, investigation of the effect of energy quantization on operation of an MOS SOI transistor, investigation of resonance tunnelling in MISIM transistor.
- [Pro30] **Digital image analysis and processing of neovascularization** (Analiza procesów neowaskularyzacji metodami cyfrowego przetwarzania obrazów), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jerzy Woźnicki, co-workers: Grzegorz Kukielka, Hanna Górkiewicz-Galwas, Jerzy Domański, Bartosz Dudziński, Ryszard Pająk, April 1999 – March 2002
- Angiogenesis is the formation of new blood vessels, which occurs in normal physiological conditions. It is also an underlying process in the pathogenesis and invasion of neoplasms. New blood vessels develop from pre-existing blood vessels. Different substances may have an influence on the process. The process of angiogenesis is subject to the effects exerted by pro- and anti-angiogenic factors released by various cells and tissues which, in normal physiological conditions, are maintained in balance. However, a loss of the balance leads to generation or inhibition of neovascularisation.
- The main goal of the project is to assess the effects of various substances on the development of new blood vessels using digital image processing system in co-operation with surgical microscope and Sidky and Averbach criteria (1975). The digital image processing methods introduce automatic quantification of surface, shape and size of new blood vessels.
- The most significant information portrayed visually in the microscopic images refers to physical changes reflecting processes in the new blood vessels as well as their geometry. Hence the first stage is to detect the contours of the objects studied. The method of detecting the contours of new blood vessels is an advanced type of filtration, which may be described as a recursive differential filter (RDF). The method used in the digital computer image processing in order to remove the information about 'large' blood vessels will allow automated quantification of new blood vessels formed in the due course of angiogenesis.
- [Pro31] **Investigations and modelling of the influence of parasitic phenomena on the operation of the VLSI circuits, taking into account manufacturing conditions** (Badanie i modelowanie wpływu zjawisk pasożytniczych na pracę układów scalonych VLSI z uwzględnieniem warunkowań technologicznych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Andrzej Pfitzner, co-workers: Elżbieta Piwowarska, Witold Pleskacz, Jacek Laskowski, Adam Lejman, Robert Miklas, Jerzy Gempel, Stanisław Jeszka, Adam Jarosz, March 1999 - February 2002
- The purpose of the project is consideration of the parasitic phenomena in the VLSI circuits and developing effective methods of modelling of these effects, taking into account disturbances of the real manufacturing process. The main research tasks are: developing new simulation methods of the parasitic phenomena like signal delays in interconnections of the RLC type; evolving effective models of the parasitic elements and methods of extraction of model parameters; developing methods of evaluation of the interactions in complicated connections configurations.
- [Pro32] **High beam quality UV lasers for microelectronics** (Opracowanie ultrafioletowych laserów generujących wysokiej jakości wiązki promieniowania dla zastosowań w mikroelektronice), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics SPUB-M associated with the NATO-SfP, project leader: Tadeusz M. Adamowicz, co-workers: Krzysztof Dzińciołowski, Wojciech Kwaśniewski, Wojciech Kamiński, Jerzy Kńsik, Piotr Warda, 1999 - 2001
- 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.
- [Pro33] **Solid state micro-lasers for visible wavelengths** (Mikrolasery ciała stałego na zakres widzialny), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Michał Malinowski, September 2000 – July 2002
- Micro-lasers are miniature, diode-laser powered, solid state lasers of particularly simple design. The laser consists of a slice of active material polished to be plane parallel with mirrors applied directly to the crystal faces. For the operation of this structure thermal and gain-related waveguiding plays an important role. The program is oriented on the analysis and investigation of these devices at visible wavelength of the spectrum. Structures fabricated from  $\text{Pr}^{3+}$ ,  $\text{Ho}^{3+}$ ,  $\text{Tm}^{3+}$  and  $\text{Er}^{3+}$  activated YAG crystals are investigated.
- [Pro34] **Novel dielectric layers for silicon carbide preserving their properties at elevated temperatures** (Nowe dielektryczne warstwy na węgliku 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 ( $\text{Al}_2\text{O}_3$ ,  $\text{TiO}_2$ ,  $\text{Ta}_2\text{O}_5$ ).
- [Pro35] **Silicon-germanium (SiGe) – material for new generation CMO devices** (Krzemogermań (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.

[Pro36] **Ultrathin SiO<sub>2</sub> and high-K dielectric layers for next generation ICs**” (Ultracienkie warstwy SiO<sub>2</sub> 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 Rużyłto, October 2000 - September 2003

The ITRFS roadmap points out clearly that the required for next few MOS-ICs gate SiO<sub>2</sub> 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 studied 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.

[Pro37] **Methodology of designing standard CMOS cells in case of realisation of low-voltage and low-power integrated circuits** (Metodyka tworzenia komórek standardowych CMOS dla potrzeb realizacji układów scalonych o niskim poborze prądu i bardzo niskim napięciu zasilania), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Marcin Sadowski, co-workers: Wiesław Kuźnicz, November 2000 - March 2002

The main research tasks of the project are: developing of new methodology of realisation and designing of electrical schemas and layouts of low-voltage low-power analogue and digital standard cells for standard bulk CMOS process. Developed methodology and standard cells will find application in design process of low-voltage Application Specific Integrated Circuits (ASIC's) with the aid of standard tools used for automatic design of ASIC's.

[Pro38] **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.

[Pro39] **New active planar photonic band-gap structures** (Nowe aktywne struktury planarne z foniczne przerw zabronion), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Paweł Szczepański, co-workers: Agnieszka Mossakowska-Wyszyńska, Anna Tyszk-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.

[Pro40] **Modelling of above threshold light generation in planar waveguide circular grating DBR laser** (Modelowanie ponadprogowej generacji promieniowania w planarnym laserze DBR o symetrii kołowej), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Tomasz Kossek, February 2001 – December 2001

A lot of researches have been made under the new class of grating-coupled surface-emitting (GCSEL) DBR lasers with circular grating up to date. The reason for such a interest is the potential possibilities to obtain high-power and low-divergence beam of circular symmetry in comparison to VCSEL lasers. Moreover, the possibility of fabrication of 2-D arrays of GCSEL DBR lasers can be a profitable advantage.

The main aim of the project was to develop semi-classical model of operation of such a laser which is based on vector-wave self-consistent nonlinear coupled-mode equations. With the help of an energy theorem and threshold field approximation an approximate formula relating small-signal gain to the output power and laser parameters has been obtained. Particularly the laser characteristics revealing the influence of such parameters as: losses in active and grating region, length of the gain region, coupling strength of the grating on optimal condition of light generation have been obtained.

[Pro41] **Passivation layers for SiC Schottky diodes** (Wybrane warstwy pasywujące dla diod Schottky'ego na węglu krzemu), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Mariusz Sochacki, September 2001 – February 2002

The aim of the project is selecting and classification of dielectric materials which are suitable for passivation of SiC-based electronic devices. Investigated are RF and pulse plasma deposited carbon, AlN, Al<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub> films. The main goal is growing of such layers onto SiC electronic structures and subsequent evaluation of their parameters. These are adhesion of films to the substrate, the influence of grown films on electrical properties of Schottky junctions as well as long-term stability of these

parameters. Also the influence of the temperature on properties of layers and I-V characteristics of Schottky diodes are being examined within the framework of this study.

- [Pro42] **Photon avalanche studies in holmium doped laser materials** (Badanie zjawiska lawinowego w materiałach laserowych domieszkowanych  $\text{Ho}^{3+}$ ), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Artur Wnuk, August 2001 – June 2002

In this work we described the photon avalanche up-conversion processes in various  $\text{Ho}^{3+}$  doped materials. The holmium ions was spectroscopically investigated in YAP, YAG, YLF crystals and ZBLAN gals.

At several excitation region we observed the up-conversion in all this materials. At 584 nm excitation we observed the photon avalanche process. This process was discussed on the basis of rate equation modelling. The calculated data was compared with experimental results. Our mathematical model was positively verified.

- [Pro43] **Characterisation of the emission properties of  $\text{Ho}^{3+}$  doped  $\text{SrLaGa}_3\text{O}_7$  and  $\text{SrLaGaO}_4$  laser crystals** (Charakterystyka własności emisyjnych kryształów laserowych  $\text{SrLaGa}_3\text{O}_7$  and  $\text{SrLaGaO}_4$  aktywowanych jonami  $\text{Ho}^{3+}$ ), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Marcin Kaczkan, August 2001 – June 2002

The principal interest in studying rare earth doped  $\text{SrLaGa}_3\text{O}_7$  (SLG) and  $\text{SrLaGaO}_4$  (SLO) crystals is due to their structural disorder and resulting inhomogeneous broadening of the optical transitions and due to the ability of accepting high concentration of activator. Holmium ion has been chosen as a dopant because it shows laser action at different wavelengths, from 550 nm to 3.9  $\mu\text{m}$ , in a variety of hosts and offers various upconversion mechanisms, which may be enhanced in SLG and SLO systems because of their structural properties.

The purpose of this investigation is to study the optical properties of  $\text{Ho}^{3+}$  in  $\text{SrLaGa}_3\text{O}_7$  and  $\text{SrLaGaO}_4$  crystals to better understand the behaviour of the rare-earth ions in these hosts and to predict their potential laser properties.

In the framework of this project the absorption, emission spectra and luminescence dynamics of excited levels will be measured. On the basis of Judd-Ofelt theory the three intensity  $\Omega_\lambda$  parameters characterising optical properties of  $\text{Ho}^{3+}$  ion in SLG and SLO hosts will be evaluated. In the next step the mechanisms of upconversion processes from infrared and red to visible light will be investigated.

- [Pro44] **Thermally induced metastability of amorphous silicon** (Termicznie indukowana metastabilnością krzemu amorficznego), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Marek Kostana, August 2001 – June 2002

The influence of the doping and hydrogen content on metastable properties of LPCVD amorphous silicon is investigated. Metastability is induced by thermal quenching. Transport parameters of the examined films and the characteristics of thin-film transistors are measured.

### 4.3. Projects Granted by International Institutions

- [Pro45] **Building Integration of Solar Technology** INCO/COPERNICUS (Integracja Technologii słonecznych z budownictwem), project no ICOP-DEMO-4080-98, WIP-Germany, Univ. Targoviste, Romania, Synthesis & Research, Greece, Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader Stanisław Pietruszko, October 1998 – October 2001

Design and installation of active and passive solar systems at the campus of the University of Targoviste in Romania. Design, installation and monitoring of photovoltaic systems.

- [Pro46] **VILAB: Microelectronics Virtual Laboratory for Co-operation in Research and Knowledge Transfer** (INCO-Project 977133), project leader: Wiesław Kuźmicz, September 1998-August 2001

Project partners are:

- FhG-IIS/EAS (Germany)
- Technical University of Budapest (Hungary)
- Tallin Technical University (Estonia)
- Warsaw University of Technology (Institute of Microelectronics and Optoelectronics) (Poland)
- Institute of Electron Technology (Poland)
- Institute of Computer Systems (Slovakia)
- Slovak Technical University, Bratislava, (Slovakia)
- Darmstadt University of Technology (Germany)
- Linkoping University (Sweden)

The main objective of this project is to set up and maintain an east-West Virtual Laboratory (VL) for promoting co-operative research, development and training activities between the partner institutions in CEE and EC countries in design of dependable microelectronic systems which is one of the most dynamically developing application fields. The main result of the project will be: establishing of a new Research Network called Virtual Laboratory and new co-operative results in design, research and teaching achieved by joint use of resources and environment of the VL.

- [Pro47] **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 Dzięciołowski, Wojciech Kamiński, 1998 - 2005

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

- [Pro48] **Investigations of degradation phenomena in termistors with negative thermal coefficient of resistance** (Badanie zjawisk starzeniowych termistorów z ujemnym temperaturowym współczynnikiem oporności) Institute of Materials of Science-Production Company „Karat”, Lvov, Ukraine project leader: Julitta Pogorzelska, co-worker: Józef Maciak, April 1998 – April 2002

The aim is technology development, investigation of physical phenomena in materials is long time period and finding materials with small degradation, which will enable correct element technology.

- [Pro49] **Measurements of Superconducting and Dielectric Materials at Microwave Frequencies and Cryogenic Temperatures.** (Pomiary nadprzewodzących i dielektrycznych właściwości materiałów w paśmie częstotliwości mikrofalowych i temperaturach kryogenicznych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics and NIST USA, project leader: Jerzy Krupka, co-worker: Zbigniew Rudkowski, financial support: M. Skłodowska - Curie Fund II (Fundusz polsko - amerykańskiej Fundacji im. M. Skłodowskiej - Curie), January 1999-December 2001

The objective of this project is to develop new techniques for measurements of electromagnetic properties of dielectric and superconducting materials at cryogenic temperatures and microwave frequencies. Specific goals of the project are as follows:

- 1) Measurements of thin dielectric films using extremely high Q whispering gallery dielectric resonator made of single crystal YAG or sapphire. We expect that using whispering gallery mode resonator it will be possible to measure electromagnetic properties of very low loss dielectric thin films deposited on its surface.
- 2) Measurements of the surface impedance of thin superconducting films.
- 3) Investigations few resonant techniques for measurements of the complex permittivity of thick and thin film ferroelectrics with and without electric bias. Split dielectric resonator and split re-entrant cavity techniques will be the methods of our investigations at room temperatures and split post sapphire resonator fixture operating at cryogenic temperatures.

The measurement programs proposed in this project will be directed at future commercial applications of dielectric and superconducting materials for both the Polish and American electronic industries. The applied research aspects of this work will be the development of new, accurate measurement methods of materials that can be used and properly qualified for total measurement uncertainties, as commercial standards.

- [Pro50] **Metastability in Amorphous Silicon** (Metastabilność w krzemie amorficznym), (MEN/DOE-98-345) from U.S. Department of Energy and Polish Ministry of National Education in cooperation with the National Renewable Energy Laboratory, Golden, CO, USA (Maria Skłodowska-Curie Joint Fund II), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Stanisław Pietruszko, 1999 – 2001

This project is directed at understanding the basic phenomena that limit the performance and reliability of thin-film amorphous solar cells. It is addressing a key fundamental research problem involving the degradation behavior of amorphous silicon. Investigation of the thermally and charge-induced metastability in unhydrogenated and hydrogenated undoped and doped amorphous silicon.

- [Pro51] **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 Dzięciołowski, Wojciech Kwaśniewski, Wojciech Kamiński, Jerzy Kąsik, 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.

- [Pro52] **Photovoltaics in the Suburban Environment** (Fotowoltaika w środowisku podmiejskim), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Stanisław M. Pietruszko, ECOLINKS (USAID), Grant no. CG3-PL-05, 2000-2001

Preparation of a feasibility study for introducing photovoltaic solar energy in a suburban setting for decentralized electrical energy supply and for integrating photovoltaics with house in the Municipality of Warszawa-Wawer. The project includes solar resources assessment with help of installed PV system.

- [Pro53] **Novel Applications of Wide Bandgap Layers** (Nowe zastosowania warstw materiałów z szeroką przerwą wzbronioną), 3<sup>rd</sup> International Conference, Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jan Szmidt, 26-30 June 2001

Within the framework of 3<sup>rd</sup> International Conference “Novel Applications of Wide Bandgap Layers” was organized a special session “KBN-Projects”. It was intended to provide a forum for presentation of scientific projects granted by the State Committee for Scientific Research, which were closely related to the scope of the Conference.

Within its framework 30 posters were presented and 2 invited lectures were given:

1) "Development of blue optoelectronics – government project" (S. Porowski);

2) "Inertness of diamond – truth or false" (S. Mitura et al.).

A discussion panel with participation of T11 thematic group member Prof. W. Janke and secretary of T11B and T11D subgroups Mrs. D. Janczak was also held as a part of this session.

- [Pro54] **Numerical modelling of the chosen devices for measuring of electromagnetic properties of the electronic materials** (Modelowanie numeryczne wybranych urządzeń do pomiaru elektromagnetycznych właściwości materiałów elektronicznych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics and NIST USA, project leader: Jerzy Krupka, co-worker: Zbigniew Rudkowski, financial support: M. Skłodowska - Curie Fund II (Fundusz polsko - amerykańskiej Fundacji im. M. Skłodowskiej - Curie), June 2001 - April 2002

The objective of this project is numerical modelling of the chosen devices for measurements of electromagnetic properties of dielectric and superconducting materials at cryogenic temperatures and microwave frequencies. The measurement programs proposed in this project will be directed at future commercial applications of dielectric and superconducting materials for both the Polish and American electronic industries. The applied research aspects of this work will be the development of new, accurate measurement methods of materials that can be used and properly qualified for total measurement uncertainties, as commercial standards.

- [Pro55] **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.

#### 4.4. Other Projects

- [Pro56] **Formation of silicon layers by means of laser zone melting recrystallization (LZMR) and their characterization** (Wytwarzanie warstw krzemowych metodą strefowej rekrytalizacji laserowej LZMR i ich charakteryzacja), project leader: Romuald B. Beck, co-workers: Krzysztof Domański, Witold Ciemiewski, Kazimierz Dalbiak, January 2000 – December 2001.

The aim of this work is to apply the laser annealing technique to manufacturing of the SOI (silicon-on-insulator) substrates. Laser zone melting recrystallization has been successfully optimized in Lviv Politechnika. IMiO PW, on the other hand, with its technological facilities is capable of performing all other processes needed for this production technique. It is expected that produced by these method substrates will be superior to other techniques (e.g. SIMOX) in terms of electrophysical properties of the silicon top layer (body).

- [Pro57] **Analysis of shearing force of SMD components on PCB** (Wykonanie badania ścinania bocznego), project leader: Krystyna Szyłko, co-workers: Ryszard Kisiel, Ryszard Biaduń, financial support: „Radwan” Warszawskie Zakłady Radiowe, May 2001 – August 2001

Using different solders the 1206 components were soldered to PCB. The influence of PCB pads covering and solder type on mechanical properties of solder joint were measured. The results of measurements and conclusion were reported for RADWAR company.

- [Pro58] **Monte Carlo analysis of the gas flow in calibration chamber of the vacuum primary standard developed by CEM** (Analiza przepływu gazu w komorze metrologicznej wzorca ciśnienia wykonanego w CEM, oparta na symulacyjnej metodzie Monte-Carlo), project leader: Piotr Szwemin, co-workers: Marek Niewiński, financial support: ASSECAL S.L. Spain, June 2001 – October 2001

The aim of this work was to improve the accuracy of the continuous expansion system of CEM and determining the uncertainties due to the nonuniform gas flux distribution in the vicinity of the calibrated gauges installed inside the calibration chamber. To achieve this the following studies were performed: a) calculations of the C orifice correction factor, b) calculations of the chamber shape correction factor c) determination of the gas flux distribution in the region where the gauge's tubulations are located. All these calculations were performed by the Monte-Carlo method.



## 5. DEGREES AWARDED

### 5.1. Ph.D. Degrees

- [PhD1] Tomasz Dębski, **Integration of the fabrication technology of micromechanical systems with the CMOS technology illustrated with the example of an AFM probe**, (Integracja technologii wytwarzania systemów mikromechanicznych z technologii CMOS na przykładzie sond dla mikroskopii sił atomowych), supervisor: Andrzej Jakubowski, June 2001
- [PhD2] Grzegorz Kukielka **Image sequence segmentation and object tracking g methods of mathematical morphology** (Metody morfologii matematycznej do segmentacji sekwencji obrazów w zastosowaniu do śledzenia ruchu obiektów), supervisor: Jerzy Woźnicki, 5 May 2001
- [PhD3] Sławomir Szostak, **Charge pumping in SOI structures: model and parameter extraction** (Metoda pompowania ładunku w strukturach SOI – model i charakteryzacja parametrów), supervisor: Andrzej Jakubowski, June 2001
- [PhD4] Karol Szymański, **The influences of vacuum chamber shape on distibutions of gas state parameters and chamber's metrological properties** (Wpływ kształtu komory próżniowej na rozkłady parametrów stanu gazu i jej właściwości metrologiczne), supervisors: Alfred Żwił, Andrzej Pfizner (from 22.06.1999), 5 March 2001.

### 5.2. M.Sc. Degrees

- [MSc1] Robert Chlebowski, **Optymalizacja stanowiska pomiarowego do badania reflektorów samochodowych przy wykorzystaniu metod przetwarzania obrazu**, advisor Hanna Górkiewicz-Galwas, very good
- [MSc2] Piotr Dziarnowski, **Układ sterowania stolikiem XY automatycznego stanowiska ostrzowego do pomiarów struktur półprzewodnikowych – oprogramowanie**, advisor Lidia Łukasiak, excellent
- [MSc3] Jakub Dzieciuch, **Zastosowanie morfologicznego algorytmu wododziału do rozwiązania problemu segmentacji obrazów cyfrowych**, advisor Hanna Górkiewicz-Galwas, excellent
- [MSc4] Arkadiusz Gmitrzak, **Analiza dynamicznej pracy dielektrycznych laserów DFB/DBR o strukturze cylindrycznej**, advisor Agnieszka Mossakowska-Wyszyńska, excellent
- [MSc5] Radosław Klimek, **Analiza transmisji promieniowania w wielomodowych włóknach stożkowych**, advisor Michał Borecki, excellent
- [MSc6] Rafał Niewczas, **Termometr światłowodowy**, advisor Maria Bebłowska, excellent
- [MSc7] Wiesław Rossa, **Estymacja pola ruchu obiektów w sekwencjach obrazów cyfrowych przy wykorzystaniu metod przestrzennych**, advisor Hanna Górkiewicz-Galwas, excellent
- [MSc8] Tomasz Surmacki, **Badanie efektów zmęzeniowych w luminoforach stosowanych w kineskopach kolorowych**, advisor Hanna Górkiewicz-Galwas, good
- [MSc9] Grzegorz Szczurek, **Dekompozycja kształtu obiektów z zastosowaniem metod morfologii matematycznej dla obrazów z gradacją poziomów jakości**, advisor Hanna Górkiewicz-Galwas, excellent
- [MSc10] Michał Wisz, **Światłowodowa sonda do badania przezroczystości cieczy (nefelometr światłowodowy)**, advisor Maria Bebłowska, excellent
- [MSc11] Paweł Wrzosek, **Zasilanie włókiem optycznych.**, advisor Michał Borecki, excellent
- [MSc12] Rafał Wyrostkiewicz, **Nadajnik optyczny z laserem Fabry-Perot do zastosowań w łączach optycznych z multipleskacją na podnośnych**, advisor Bogdan Galwas, very good
- [MSc13] Marcin Wysocki, **Analiza transmisji promieniowania w wielomodowych włóknach optycznych na dowolnie ukształtowanych skrętach**, advisor Michał Borecki, excellent
- [MSc14] Aneta Błaszczyk, **Rozpoznawanie obiektów płaskich przy pomocy wykorzystania inwariantnych cech obszarów na obrazach cyfrowych**, advisor Hanna Górkiewicz-Galwas, excellent
- [MSc15] Krzysztof Bychowski, **wpływ charakterystyk filtru cyfrowego na subiektywnie postrzeganą jakoś dźwięku odtwarzanego z płyty CD**, advisor Zbigniew Kulka, excellent
- [MSc16] Piotr Chojnacki, **Mikrofalowy oscylator tranzystorowy o częstotliwości modulowanej optycznie**, advisor Bogdan Galwas, very good
- [MSc17] Paweł Czuma, **Analiza wzmocnienia w aktywnych strukturach fotonicznych**, advisor Paweł Szczepański, excellent
- [MSc18] Marek Hodyński, **Badanie stabilności pracy włóknowego lasera Yb<sup>3+</sup>**, advisor Michał Malinowski, excellent
- [MSc19] Mariusz Jakubowski, **Projekt układu scalonego implementujący cyfrowy procesor komórkowy do przetwarzania obrazów**, advisor Stanisław Jankowski, excellent
- [MSc20] Andrzej Jeżewski, **Badania warunków generacji ultrafioletu w wyładowaniu w mieszaninach neonu i halidków miedzi**, advisor Tadeusz Adamowicz, good
- [MSc21] Sławomir Józwiak, **Badanie pola przepływu optycznego w sekwencji obrazów cyfrowych przy wykorzystaniu filtrów czasowo przestrzennych**, advisor Jerzy Woźnicki, very good
- [MSc22] Dominik Kasprowicz, **Generacja wektorów tekstowych wykrywających zwarcia w kombinacyjnych układach scalonych CMOS**, advisor Witold Pleskacz, excellent
- [MSc23] Artur Kokoszka, **Wykorzystanie metody i narzędzia "Workflow" (diagram pracy) w rozproszonym projektowaniu elementów cyfrowej kamery w oparciu o środowisko ASTAI**, advisor Mikołaj Baszun, excellent

- [MSc24] Urszula Kołakowska, **Optymalizacja metod segmentacji obszarowej do analizy obrazów mikroskopowych**, advisor Hanna Górkiewicz-Galwas, very good
- [MSc25] Krzysztof Kucharski, **Klasyfikacja tekstur przy użyciu lokalnej analizy składowych głównych**, advisor Jerzy Woźnicki, excellent
- [MSc26] Marcin Mogielnicki, **Analiza warunków pracy głowicy inteligentnego światłowodowego czujnika rodzaju cieczy**, advisor Jerzy Kruszewski, excellent
- [MSc27] Marek Morzuch, **Badanie współczynników dyfuzji atomów metali w gazach szlachetnych**, advisor Tadeusz Adamowicz, excellent
- [MSc28] Adam Orzechowski, **Oscylacja prądu tunelowego Fowlera-Wordheina jako źródło informacji o strukturze MOS**, advisor Bogdan Majkusiak, excellent
- [MSc29] Grzegorz Pastuszek, **Mikroprocesor o zmniejszonym poborze mocy**, advisor Wiesław Kuźmich, excellent
- [MSc30] Artur Podczaski, **Metody projektowania anten planarnych o powiększonym paśmie pracy**, advisor Bernard Jakubowski, very good
- [MSc31] Adam Przybysz, **Analiza propagacji w światłowodach z fonicznymi przerwami zabronionymi**, advisor Paweł Szczepański, excellent
- [MSc32] Bartłomiej Szymański, **Badanie możliwości generacji ultrafioletu w laserze wnękowym Ne/He-Zn**, advisor Tadeusz Adamowicz, good
- [MSc33] Maksymilian Włodarski, **Interferencyjny filtr korekcji temperatury barwowej**, advisor Jerzy Kruszewski, excellent
- [MSc34] Arkadiusz Wojtowicz, **Charakteryzacja tranzystorów MOS z ultra cienkim tlenkiem bromkowym**, advisor Bogdan Majkusiak, excellent
- [MSc35] Michał Zaborowski, **Analiza mocy szumów w wielomodowych wzmacniaczach optycznych**, advisor Michał Borecki, good
- [MSc36] Janusz Zambrzycki, **Zastosowanie metod cyfrowego przetwarzania obrazu do wykrywania uszkodzeń maski cieniowej kineskopu**, advisor Hanna Górkiewicz-Galwas, excellent

### 5.3. B.Sc. Degrees

- [BSc1] Wojciech Całka, **Modelowanie mikroelektronicznych przetworników akustycznych**, advisor Mikołaj Baszun, excellent
- [BSc2] Michał Gałęzka, **Trawienie warstw dielektrycznych wspomagane plazmą RF**, advisor Jan Szmidt, excellent
- [BSc3] Łukasz Janas, **Metody poprawy zbieżności algorytmu numerycznej symulacji elementów układów scalonych**, advisor Andrzej Pfizner, very good
- [BSc4] Tomasz Kasjanik, **Badanie widma promieniowania He - Ne - opracowanie laboratoryjnego ńwiczenia**, advisor Jerzy Kęsik, excellent
- [BSc5] Mirosława Modzelewska, **Ocena zmian zbieżności kineskopu kolorowego typu A66EHJ43x38 mierzonej w wybranych punktach ekranu**, advisor Hanna Górkiewicz-Galwas, excellent
- [BSc6] Tomasz Pomorski, **Projekt procesora cyfrowej syntezy dźwięku w technice komórek standardowych**, advisor Mirosław Grygolec, very good
- [BSc7] Jacek Rosiak, **Graficzny interfejs do programu ekstrakcji schematu w systemie UNIX - X Window**, advisor Adam Wojtasik, excellent
- [BSc8] Paweł Sabatowicz, **Opracowanie, badanie i optymalizacja wewnętrznego miernika mocy lasera argonowo - kryptonowego**, advisor Piotr Warda, excellent
- [BSc9] Paweł Zajęzkowski, **Opracowanie modelu Verilog HDL automatu komórkowego do ekstrakcji konturu obiektu**, advisor Andrzej Wielgus, excellent
- [BSc10] Tomasz Bieniek, **Wytwarzanie ultracienkich warstw dielektrycznych na potrzeby technologii MOS-VLSI**, advisor Romuald Beck, excellent
- [BSc11] Ernest Brzozowski, **Konstrukcja głowicy spektrometru optycznego opartego na przetworniku CCD**, advisor Michał Borecki, fairly good
- [BSc12] Artur Ciubak, **Ekstrakcja parametrów desorpcji i innych źródeł gazu z modeli procesów pompowania**, advisor Piotr Szwemin, very good
- [BSc13] Tomasz Czerko, **Opracowanie systemu sterowania położenia kamery elektrooptycznej**, advisor Ryszard Pajek, good
- [BSc14] Anna Domańska, **Modelowanie przyrządów z SiGe - parametry dynamiczne**, advisor Andrzej Jakubowski, excellent
- [BSc15] Tomasz Fręczek, **Mikrofalowy wzmacniacz antenowy**, advisor Jerzy Skulski, excellent
- [BSc16] Paweł Gonciara, **Badanie materiałów na piezorezystywne grubowarstwowe czujniki ciśnienia**, advisor Zbigniew Szczepański, excellent
- [BSc17] Marcin Grędzki, **Projektowanie systemów fotowoltaicznych z cienkowarstwowymi przyrządami półprzewodnikowymi**, advisor Stanisław Pietruszko, excellent
- [BSc18] Marek Jonkisz, **Implementacja i badanie właściwości filtra typu Canny dla różnych klas obrazów rzeczywistych**, advisor Grzegorz Kukielka, very good
- [BSc19] Bernard Jurewicz, **Koncepcja i wstępne badania mikrofalowego miernika zmiennych odległości**, advisor Jerzy Kalenik, very good
- [BSc20] Krzysztof Klimczak, **Wytwarzanie i charakterystyka cienkich warstw amorficznych półprzewodników i dielektryków**, advisor Jan Szmidt, excellent
- [BSc21] Andrzej Kociubiński, **Porównanie charakterystyk I-V złącz P-N z różnych materiałów**, advisor Andrzej Jakubowski, good

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- [BSc22] Zenon Kopeć, **Światłowodowy czujnik do badania stanu powierzchni**, advisor Maria Bełłowska, excellent
- [BSc23] Anna Miecznik, **Badanie właściwości rezystorów grubowarstwowych wykonanych z past molibdenowych**, advisor Jerzy Kalenik, excellent
- [BSc24] Marcin Ożdziński, **Projekt i badanie czujnika pola magnetycznego z kompensacją napięcia asymetrii hallotronu**, advisor Jerzy Kalenik, excellent
- [BSc25] Tomasz Pawłowski, **Właściwości i zastosowania segmentacji cyfrowych danych obrazowych przy wykorzystaniu metod segmentacji przez podział**, advisor Grzegorz Kukielka, excellent
- [BSc26] Bartłomiej Perkowski, **Światłowodowy czujnik przemieszczenia**, advisor Maria Bełłowska, excellent
- [BSc27] Paweł Racis, **Modelowanie systemu zdalnej kontroli prędkości**, advisor Mikołaj Baszun, very good
- [BSc28] Teodor Rżkiewski, **Nadajnik z modulacją fazy do łącza optycznego - projekt, wykonanie i badanie**, advisor Bogdan Galwas, good
- [BSc29] Przemysław Rogalski, **Modelowanie i symulacja komputerowa procesów kooperatywnego projektowania inżynierskiego w internecie**, advisor Mikołaj Baszun, very good
- [BSc30] Anna Sidlarewicz, **Metody modyfikacji kodu VHDL umożliwiające samotestowalność układów po syntezie RTL**, advisor Elżbieta Piwowarska, excellent
- [BSc31] Łukasz Siwek, **Parametry naprawianych połączeń klejowych**, advisor Ryszard Kisiel, good
- [BSc32] Paweł Szymański, **Program preprocesora optymalizacyjnego do programu symulacji układowej SPICE**, advisor Adam Wojtasik, very good
- [BSc33] Paweł Żnecikowski, **Plazmowe procesy trawienia węgla krzemu**, advisor Jan Szmidt, excellent
- [BSc34] Michał Zdanowicz, **Światłowodowy układ wizualizacji zanieczyszczeń wody**, advisor Maria Bełłowska, excellent
- [BSc35] Jarosław Żelazko, **Korelacja pomiędzy parametrami procesów trawienia i nakładania plazmowego dielektrycznych warstw węglowych**, advisor Antoni Siennicki, excellent

## 6. PUBLICATIONS

### 6.1. Scientific and Technical Papers published in Journals Included in the ISI<sup>1</sup> Database

Number	Authors	Journal	Title, volume, pages
[Pub1]	M. Blyzniuk, I.Kazymyra, W.Kuźmicz, W.A.Pleskacz, J.Raik, R.Ubar	Microelectronics Reliability	Probabilistic Analysis of CMOS Physical Defects in VLSI Circuits for Test Coverage Improvement, vol. 41/12, pp. 2023-2040
[Pub2]	M.Borecki, J.Kruszewski	Optica Applicata	Intelligent high resolution sensor for detecting of liquid mediums, vol. XXXI. No 4, pp. 691-699
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[Pub24]	R.B.Beck, A.Jakubowski, L. Łukasiak, M. Korwin-Pawłowski	Journal of Telecommunications and Information Technology	Challenges in ultrathin oxide layers formation ,pp. 27-34
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[Pub34]	W.Kuźmicz, W.A.Pleskacz, J.Raik, R.Ubar	Proceedings of the Estonian Academy of Science – Engineering	Module Level Defect Simulation in Digital Circuits, , vol. 7/4, (Proc. Estonian Acad. Sci. Eng., vol. 7, no 4, pp.253-268), pp. 253-268
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## 7. REPORTS

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- [Rep9] Bogdan Galwas, **The Development of Teleinformatics and Multimedia Methods and Tools for Education of Engineers** (Rozwój metod i narzędzi teleinformatycznych i multimedialnych w kształceniu inżynierów)
- [Rep10] Hanna Górkiewicz-Galwas, **Digital image sequence segmentation for motion detection and analysis** (Segmentacja sekwencji obrazów cyfrowych na potrzeby detekcji i analizy ruchu)
- [Rep11] Hanna Górkiewicz-Galwas, **Real time analysis of blood-vessel structures in medical images** (Analiza struktur naczyniowych w obrazach medycznych w czasie rzeczywistym)
- [Rep12] Jerzy Kaśik, **Ion argon laser discharge tube technology** (Opracowanie technologii wykonania kapilary wyładowczej jonowego lasera argonowego)
- [Rep13] Jerzy Krupka, **Directivity analysis for piezoelectric ultrasonic transducers** (Analiza charakterystyk kierunkowych promieniowania piezoelektrycznych przetworników ultradźwiękowych)
- [Rep14] Jerzy Krupka, **Measurements of Superconducting and Dielectric Materials at Microwave Frequencies and Cryogenic Temperatures** (Pomiary nadprzewodzących i dielektrycznych właściwości materiałów w paśmie częstotliwości mikrofalowych i temperaturach kryogenicznych)
- [Rep15] Jerzy Krupka, **Methodology and software development for measuring systems of chosen properties of electronic materials** (Rozwój metodyki badań i oprogramowania systemów pomiarowych do badań wybranych właściwości materiałów elektronicznych)
- [Rep16] Jerzy Kruszewski, **An arrangement for investigation of optoelectronic devices** (Stanowisko do badań układów optoelektronicznych)
- [Rep17] Jerzy Kruszewski, **Elaboration and investigation of fibre optic nephelometer.** (Opracowanie i badanie nefelometru światłowodowego)
- [Rep18] Jerzy Kruszewski **The functional model of intelligent liquid recognition sensor** (Model użytkowy inteligentnego czujnika rozpoznawania cieczy)
- [Rep19] Wiesław Kućmierz, **VILAB: Microelectronics Virtual Laboratory for Co-operation in Research and Knowledge Transfer**
- [Rep20] Bogdan Majkusiak, **Modelling And Characterization Of Quantum Effects In MOS SOI Devices** (Modelowanie i charakterystyka efektów kwantowych w przyrządach typu MOS SOI)
- [Rep21] Bogdan Majkusiak, **Physical phenomena and devices of nanoelectronics** (Zjawiska fizyczne i przyrządy nanoelektroniki)

- [Rep22] Michał Malinowski, **Modeling and investigation of dielectric laser structure for visible wavelengths** (Modelowanie i badanie dielektrycznych struktur laserowych na zakres widzialny)
- [Rep23] Michał Malinowski, **Modeling and investigation of neodymium doped fiber laser** (Analiza pracy i badanie neodymowych laserów światłowodowych)
- [Rep24] Michał Malinowski, **Praseodymium doped fiber waveguide visible laser** (Model uaytkowy widzialnego lasera włóknowego aktywowanego jonami  $\text{Pr}^{3+}+\text{Yb}^{3+}$  pompowanego diodą laserową)
- [Rep25] Stanisław Pietruszko, **Building Integration of Solar Technology INCO/COPERNICUS** (Integracja Technologii słonecznych z budownictwem)
- [Rep26] Stanisław Pietruszko, **Investigation of the influence of phosphorous doping and hydrogen content on stability of amorphous silicon** (Badanie wpływu domieszkowania fosforem i zawartości wodoru na stabilność krzemu amorficznego)
- [Rep27] Stanisław Pietruszko, **Metastability in Amorphous Silicon** (Metastabilność w krzemie amorficznym)
- [Rep28] Stanisław Pietruszko, **Photovoltaics in the Suburban Environment** (Fotowoltaika w środowisku podmiejskim)
- [Rep29] Julitta Pogorzelska, **Degradation Analysis of phenomena in ceramics with negative temperature coefficient of resistance** (Analiza zjawisk degradacyjnych w ceramice termistorowej z ujemnym temperaturowym współczynnikiem oporności)
- [Rep30] Julitta Pogorzelska, **Investigation of degradation mechanism in thermistor ceramics with negative temperature coefficient** (Badanie mechanizmu degradacji ceramiki termistorowej z ujemnym temperaturowym współczynnikiem oporności)
- [Rep31] Paweł Szczepański, **Solid state lasers with  $\mu\text{m}$ -size confined structures** (Badanie i modelowanie dielektrycznych mikrostruktur laserowych)
- [Rep32] Zbigniew Szczepański, **Investigation of Flip Chip Joints Reliability** (Badania niezawodności połączeń struktur z kontaktami podwyższonymi)
- [Rep33] Jan Szmidt, **Laboratory complex „Semiconductor Devices”** (Zespół laboratoriów „Przyrządy Półprzewodnikowe”)
- [Rep34] Jan Szmidt, **Microelectronic structures with plasma deposited diamond films** (Mikroelektroniczne struktury z udziałem warstw diamentowych wytwarzanych w procesach plazmochemicznych)
- [Rep35] Jan Szmidt, **Novel Applications of Wide Bandgap Layers** (Nowe zastosowania warstw materiałów z szeroką przerwą wzbronioną)
- [Rep36] Piotr Szwemin, **Modelling and verification of primary standards for high and ultra high vacuum** (Modelowanie i weryfikacja układów metrologicznych generujących niskie i bardzo niskie ciśnienia gazu)
- [Rep37] Piotr Szwemin, **Monte Carlo analysis of the gas flow in calibration chamber of the vacuum primary standard developed by CEM** (Analiza przepływu gazu w komorze metrologicznej wzorca ciśnienia wykonanego w CEM, oparta na symulacyjnej metodzie Monte-Carlo)
- [Rep38] Piotr Szwemin, **Simulation methods in designing and analysis of high vacuum systems.** (Metody symulacyjne w projektowaniu i analizie układów wysokiej i bardzo wysokiej próżni)
- [Rep39] Piotr Szwemin, **The development of computer program for simulation analysis of vacuum primary standards parameters.** (Opacowanie programu komputerowego do analizy układów metrologicznych o symetrii osiowej)
- [Rep40] Krystyna Szylo, **Analysis of shearing force of SMD components on PCB** (Wykonanie badania ścinania bocznego)
- [Rep41] Aleksander Werbowy, **Aluminum nitride (AlN) passivation and protective layers for silicon carbide-based (SiC) Schottky diodes** (Pasywujące i zabezpieczające warstwy azotku glinu (AlN) dla diod Schottky’ego na węgliku krzemu (SiC))
- [Rep42] Jerzy Woźniak, **Texture classification using local principle components analysis** (Klasyfikacja tekstur przy użyciu lokalnej analizy składowych głównych)

## 7.2. Other Reports

- [Rep43] Piotr Szwemin, **Analysis of the gas flow in calibration chamber of the vacuum primary standard developed by CEM** (Analiza przepływu gazu w komorze metrologicznej wzorca ciśnienia wykonanego w CEM), 14 September 2001 for Centro Español de Metrologia, Spain
- [Rep44] Piotr Szwemin, **Monte Carlo analysis of the gas flow in XHV chamber of the vacuum primary standard CE3 developed by PTP** (Analiza przepływu gazu w komorze metrologicznej wzorca ciśnienia CE3 wykonanego w PTB oparta na symulacyjnej metodzie Monte-Carlo), January 2001 for Physikalisch - Technische Bundesanstalt, Germany

## 8. PATENTS

- [Pat1] M.Grygolec, M.Niewczas, **The circuit for weighted mean evaluation especially suitable for the defuzzyfication** (Układ wyznaczający średnią ważoną, zwłaszcza do defuzzyfikacji), (patent: P316298, notified: 26.09.1996, provided: 28.02.2001 WUP 02/01)

## 9. CONFERENCES, SEMINARS AND MEETINGS

### 9.1. International Conferences

- [Con1] **2<sup>nd</sup> IEEE International Symposium on Quality Electronic Design – ISQED 2001**, San Jose, USA, March  
reporter: W.Pleskacz
- [Con2] **2<sup>nd</sup> IEEE International Workshop on Yield Optimization & Test Baltimore**, Maryland, USA, November  
program committee member: W.Pleskacz
- [Con3] **3<sup>rd</sup> Electronic Circuits and Systems Conference – ECS'01**, Bratislava, Slovakia, September  
reporter: W. Kuźmicz
- [Con4] **3<sup>rd</sup> International Conference „Novel Applications of Wide Bandgap Layers”**, Zakopane, Poland, June 26-30  
reporters: J.Szmidt, B.Majkusiak, A.Jasik, A.Werbowy  
speakers: A.Jakubowski, R.B.Beck, J.Szmidt, A.Werbowy, L.Łukasiak, B.Majkusiak  
chairman: J.Szmidt  
scientific secretary: A.Werbowy  
conference manager: M.Trzaskowska  
organizing and program committee members: B.Majkusiak, R.B.Beck, P.Szwemin  
honorary and steering committee member: A.Jakubowski  
technical support: W.Ciemiewski, K.Dalbiak, A.Sikorska, A.ęmiech
- [Con5] **4<sup>th</sup> International Workshop on IEEE Design and Diagnostics of Electronic Circuits and Systems – IEEE DDECS 2001**, Gyor, Hungary, April  
reporter: W.Pleskacz
- [Con6] **5<sup>th</sup> International Conference on Excited States of Transitions Elements ESTE'5**, Wrocław – Łędek Zdrój, Poland, June 6-11  
reporters: M.Malinowski, A.Wnuk
- [Con7] **5<sup>th</sup> International Symposium on Microelectronic and Microsystem Technologies**, Pitesti, Romania, June 7-9  
reporters: R.Kisiel, Z.Szczepański
- [Con8] **6<sup>th</sup> European Conference on Liquid Crystals**, Halle (Salle), Germany, March  
reporter: T.Grudniewski
- [Con9] **6<sup>th</sup> International Conference: “The Experience of Designing and Application of CAD Systems in Microelectronics” – CADSM'2001**, Slavsko, Ukraine, February  
speakers: W.Pleskacz, E.Piowarska  
program committee members: W.Kuźmicz, W.Pleskacz
- [Con10] **7<sup>th</sup> European Vacuum Conference**, Madrit, Spain, September 17-20  
reporters: P.Szwemin, M.Niewięski  
program committee member: P.Szwemin
- [Con11] **8<sup>th</sup> International Conference Mixed Design of Integrated Circuits and Systems MIXDES 2001**, Zakopane, Poland, June 21-23  
speakers: W.Kuźmicz, W.Pleskacz, A.Jarosz, A.Pfitzner, B. Majkusiak  
reporter: M.Grygolec  
organizing and program committee member: W.Kuźmicz  
program committee member: A.Pfitzner
- [Con12] **9<sup>th</sup> International Conference, CAIP 2001**, Warsaw, Poland, September  
reporters: G.Kukielka, J.Woźnicki
- [Con13] **10<sup>th</sup> EDEN Conference**, Stockholm, Sweden, June 10-13  
reporter: B.A.Galwas
- [Con14] **11<sup>th</sup> International Conference On Electrical Bioimpedance**, Oslo, Norway, June 17-21  
reporter: B.A.Galwas
- [Con15] **11<sup>th</sup> International Workshop on the Physics of Semiconductor Devices**, Timapur Delhi, India, December 11-15  
reporters: K. Domański, R.B.Beck, A.Jakubowski, J.Gibki, A.Zaręba, L.Łukasiak  
international committee members: A.Jakubowski, L.Łukasiak
- [Con16] **12<sup>th</sup> European Conference on Diamond, Diamond-Like Materials, Carbon Nanotubes, Nitrides & Silicon Carbide**, Budapest, Hungary, September 2-7  
reporters: J.Szmidt, A.Werbowy, M.T.Htun Aung, R.B.Beck
- [Con17] **12<sup>th</sup> International Photovoltaic Science and Engineering Conference**, Cheju, Korea, June 11-15  
reporter: S.Pietruszko
- [Con18] **13<sup>th</sup> European Microelectronics and Packing Conference & Exhibition IMAPS**, Strasbourg, May 30- June 1  
reporter: R.Kisiel
- [Con19] **17<sup>th</sup> European Photovoltaic Conference and Exhibition**, Munich, Germany, October 22-26  
audience: S.Pietruszko  
program committee member: S.Pietruszko
- [Con20] **24<sup>th</sup> International Spring Seminar on Electronics Technology, ISSE'01**, Calimanesti, Romania, May 5-9  
reporter: R.Kisiel

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- [Con21] **25<sup>th</sup> International Conference and Exhibition, IMAPS - Poland**, Rzeszów – Polańczyk, Poland, September 26-29  
reporters: R.Kisiel, Z.Szczepański, J.Kalenik
- [Con22] **199<sup>th</sup> Meeting of The Electrochemical Society**, Washington, USA, March 25-29  
reporter: B.Majkusiak
- [Con23] **COMITE'2001**, Pardubice, Czech Republic, September 18-19  
reporters: Z.R.Szczepaniak, B.A.Galwas
- [Con24] **Conference CLEO/Europe-EQEC 2001**, Munich, Germany, June 18-22  
reporters: T.Kossek, P.Szczepański
- [Con25] **ENERGEX**, Cracov, Poland, May 19-24  
organizing and program committee member: S.Pietruszko
- [Con26] **EuMC2001**, London, UK, September 24-28  
reporter: B.A.Galwas
- [Con27] **European Physical Society Conference on High Efficiency Solar Cells**, Tomar, September 8-13  
audience: S.Pietruszko
- [Con28] **IEEE International Symposium on Defect and Fault Tolerance in VLSI Systems – DFT'01**, San Francisco, USA, October  
speaker: W.Pleskacz
- [Con29] **IEEE MTT-S International Microwave Symposium Digest**, May 3  
reporter: J.Krupka
- [Con30] **III Międzynarodowa Konferencja Obwody Drukowane**, Dśbe, Poland, October 17-18  
reporters: R.Kisiel, Z.Szczepański  
program committee member: R.Kisiel
- [Con31] **INFOS'2001**, Udine, June 20-23  
reporter: B.Majkusiak
- [Con32] **International Conference on Amorphous and Microcrystalline Semiconductors**, Nice, France August 25-29  
audience: S.Pietruszko
- [Con33] **International Conference on Dynamical Processes in Excited States of Solids DPC'01**, Lyon, France, July 1-4  
reporter: M.Malinowski
- [Con34] **International Conference on Safety and Reliability**, Szczyrk, Poland, May 22-25  
reporter: J.Pogorzelska
- [Con35] **Miezdynarodnaja Nauczno-Mietodiczeskaja Konferencja: "Distancjonnyje Obuczenje - Obrazovatielnaja Sreda XXI veka"**, Minsk, Belarus, December  
speaker: E.Piwowarska  
program committee member: E.Piwowarska
- [Con36] **SHTM-2001 International Conference Superhard Tool Materials on the Turn of the Centuries: Production, Properties, Applications**, Kijew, Ukraine, July 4-6  
reporters: J.Szmidt, A.Werbowy
- [Con37] **Special Section for Microwave Materials Worksop, APMC'2001**, Taipei, Taiwan, December 3-6  
reporter: J.Krupka
- [Con38] **Symposium on VLSI Technology Digest of Technical Papers 2001**, Kyoto, Japan, June 12-14  
reporter: M.Jurczak
- [Con39] **Symposium Techniczne, Ekologiczne i Ekonomiczne Aspekty Energetyki Odnawialnej**, Warsaw, Poland, October 19-20  
reporter: S.Pietruszko
- [Con40] **The International Symposium on Systems Integration**, Baden-Baden, Germany, July 31 – August 4  
reporter: M.Baszun
- [Con41] **„BICHIK”, Haciohalhogo Yhibepcutety „Libibcka Nolitexhika**,  
reporter: Z.Szczepański
- [Con42] **WMOVPE-IX**, UK, June 10-13  
reporter: B.Majkusiak
- [Con43] **World Renewable Energy Congress**, Cologne, Germany, June 29 – July 5  
program committee member: S.Pietruszko
- [Con44] **Wtaraj miezdunarodnoj nauczno-praktyczeskoj konferenciji "Cowremiennyje informacjonnyje i elektronnyje technologii"**, Ukraine, May 28-31  
reporter: J.Pogorzelska
- [Con45] **XIV Conference on Liquid Crystals**, Zakopane, Poland, September 25-30  
reporter: T.Grudniewski
- [Con46] **XXX International School on the Physics of Semiconductor Compounds**, Jaszowiec, Poland, June 1-8  
reporter: B.Majkusiak
- [Con47] **XXXVI International Conference on Phenomena in Ionized Gases**, Nagoya, Japan, July 17-22  
reporter: T.Adamowicz

## 9.2. Local Conferences

- [Con48] **II Kongres Polskiego Towarzystwa Próżniowego**, Warsaw, May 13-17  
 reporter: M.Niewiński  
 audience: P.Szwemin  
 program committee member: P.Szwemin
- [Con49] **Krajowa Konferencja Metrologii KKM – wystawa**, Warsaw, June  
 reporters: J.Kruszewski, M.Bebłowska, M.Borecki
- [Con50] **Symposium OPTOELEKTRONIKA 2001**, Warsaw, November 14-15  
 reporters: P.Szczepański, T.Kossek, P.Czuma, A.Mossakowska-Wyszyńska, R.Paszkiewicz, A.Tyszka-Zawadzka, W.Kamiński, J.Kósiak, T.M.Adamowicz, W.Kamiński, K.Dziściółowski, K.Dziściółowski
- [Con51] **XLVIII Otwarte Seminarium z Akustyki**, Polanica Zdrój, September 11-14  
 reporter: M.Baszun
- [Con52] **Polsko-Amerykańskie Symposium Photovoltaics in the Suburban Environment**, December 4-5  
 main organizer: S.Pietruszko

## 9.3. Schools and Seminars

- [Con53] **11<sup>th</sup> International Travelling Summer School on Microwaves & Lightwaves**, Madrid, Spain, July 7-12  
 speaker: P.Szczepański
- [Con54] **Institute Seminar: Badania warunków generacji ultrafioletu w laserach jonowych na mieszaninach gazów szlachetnych i par metali**, February 22  
 speaker: K.Dziściółowski  
 audience: M.Malinowski, T.Adamowicz, P.Witoński, W.Kamiński, R.Piramidowicz, A.Mossakowska-Wyszyńska, J.Kósiak, W.Kwaśniewski, A.Gmitrzak, P.Warda, P.Szwemin, A.Jakubowski
- [Con55] **Institute Seminar: Charakteryzacja bardzo cienkich układów podwójnych warstw dielektrycznych metodami elektrycznymi**, May 24  
 speaker: A.Wojtkiewicz  
 audience: P.Szwemin, A.Jakubowski, R.Beck, J.Szmidt, S.Szostak, A.Zarśba, K.Domański
- [Con56] **Institute Seminar: Model niechłodzonego detektora podczerwieni opartego o związki CdHgTe**, May 24  
 speaker: P.Brzoźowski  
 audience: P.Szwemin, R.Beck, J.Kalenik, K.Domański, A.Wojtkiewicz, A.Jakubowski, J.Piotrowski
- [Con57] **Institute Seminar: Modelowanie i charakteryzacja przyrządów półprzewodnikowych z krzemogermanem**, June 7  
 speaker: A.Zarśba  
 audience: J.Walczak, P.Witoński, A.Pfitzner, P.Szczepański, J.Kruszewski, A.Tyszka-Zawadzka, A.Jakubowski, L.Łukasiak, R.Beck, A.Werbowy, J.Szmidt, S.Szostak, K.Domański, A.Wojtkiewicz
- [Con58] **Institute Seminar: Modelownie czujników z akustyczna fałs powierzchniów**, May 24  
 speaker: D.Grządka  
 audience: P.Szwemin, M.Baszun, P.Szczepański, A.Pfitzner, J.Krupka
- [Con59] **Institute Seminar: Modelownie czujników z akustyczna fałs powierzchniów**, September 13  
 speaker: D.Grządka  
 audience: A.Pfitzner, J.Krupka, J.Szmidt, A.Jakubowski
- [Con60] **Institute Seminar: System on Chip ... gdzie sś nasze szanse?**, November 16  
 speaker: M.Niewczas  
 audience: A.Pfitzner, J.Szmidt, A.Jakubowski, W.Kuśmierz, P.Szwemin, Z.Jaworski, E.Piwowska, A.Wojtasik, M.Grygolec, G.Janczyk, A.Jarosz, W.Jońca, A.Kowalczyk, D.Kasprowicz, A.Lejman, J.Laskowski, D.Sarna
- [Con61] **Institute Seminar: Technologia niskociśnieniowej epitaksji z fazy gazowej z wykorzystaniem prekursorów metalo-organiczných dla realizacji heterostruktur półprzewodnikowych A<sup>3</sup>B<sup>5</sup> do zastosowań w nanoelektronice**, February 22  
 speaker: K.Kosiel,  
 audience: P.Szwemin, A.Pfitzner, A.Jakubowski, R.Beck, B.Majkusiak, A.Werbowy, A.Gmitrzak, P.Warda, A.Wnuk, J.Szmidt

## 10. PRIZES

- [Prize1] Małgorzata Jurczak, **2000 EDS Paul Rappaport Award** (“SON (Silicon-on-Nothing) – An Innovative Process for Advanced CMOS”), M. Jurczak, et.al., in T-ED, November 2000, vol.. 47, No. 11. Info. In IEEE Electron Devices Society Newsletter, October 2001
- [Prize2] Jerzy Piotrowski, **First Degree Rector Award for Scientific Achievement 2001**