WARSAW UNIVERSITY OF TECHNOLOGY
Faculty of Electronics and Information Technology

Institute of Microelectronics and Optoelectronics

annual report 2014

WARSAW UNIVERSITY OF TECHNOLOGY
Faculty of Electronics and Information Technology

Institute of Microelectronics and Optoelectronics

annual report 2014

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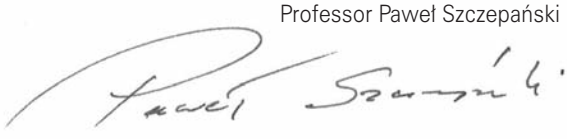
From the Director

This Annual Report summarizes the activities of the Institute of Microelectronics and Optoelectronics (IMiO) in the year 2014, with particular attention given to its research and educational potential. The Institute is a part of the Faculty of Electronics and Information Technology, the biggest faculty of the Warsaw University of Technology. Among six institutes constituting the Faculty, Institute of Microelectronics and Optoelectronics is the one most focused on advanced technologies of modern electronics and photonics.

It should be noted that the Institute has its roots deep in history. Although formally founded in 1970, it evolved from the Chair of Radio Engineering established in 1929 by Professor Janusz Groszkowski, who is often called "the father of Polish electronics". The Institute is linked with the beginnings of the Faculty of Electronics and Information Technology not only by the person of Prof. Groszkowski, who worked in IMiO until end of his career, but also by location – half of the Institute is situated in the Building of Radio Engineering at the Warsaw University of Technology main campus, where the Faculty started its operation in 1951 (as the Faculty of Communications). Currently, the Institute's Technology Centre is located there. It includes laboratories specializing in silicon processing (clean-room), hybrid technologies and assembly techniques, fibre optic and integrated optoelectronics, laser optoelectronics and characterization of new electronic and photonic materials. Recently, the research potential of the Institute has been significantly improved due to investments conducted within the Innovative Economy Operational Programme framework. As the result, 11 high-tech laboratories offering high quality scientific services in the field of advanced electronic and photonic technologies have been established in IMiO. Most of these labs had reached their full operational readiness by the end of 2012, two of them are presently at the final stage of development.
The present research activities of the Institute are concentrated in the area of microelectronics, nanoelectronics and photonics. These include in particular VLSI systems, microelectronic and nanoelectronic semiconductor devices, hybrid circuits (e.g. microwave, optoelectronic), sensors, microsystems, lasers, fiber optics and integrated photonics, electronic imaging and image processing. It is worth to emphasize that research activities of the Institute include modelling, CAD, manufacturing and versatile characterization. In the field of teaching, the Institute meets the challenges posed by the development of modern technology and information society. The educational offer (at all levels – B.Sc., M.Sc. and Ph.D.) reflects the main fields of the advanced electronics and photonics and, simultaneously, the main research expertise of the Institute. In the last year, the Institute continued to improve its contribution to the on-campus study program carried out together with the Institute of Electronic Systems in the field of Electronics and Computer Engineering. Since 2012, IMiO also provides a Microelectronics, Photonics and Nanotechnology M.Sc. teaching program. The Institute's involvement in distance learning studies of Electronics and Telecommunications is also worth mentioning, especially postgraduate studies in the domain of tools and techniques of virtual education that began in 2004. Since 2009 IMiO provides a teaching program for the students of the Faculty of Management with the aim of educating future managers in electronic equipment production. IMiO also inspired and was actively involved in the organization of a series of popular science lectures aiming at encouraging secondary-school students to continue their education at our Faculty. Preparing the specification of the equipment for new laboratories located in recently expanded wings of the Faculty building was an important task carried out in 2014. These laboratories will improve considerably the quality of the education offered by IMiO.

I express my sincere appreciation to all colleagues for your achievements which determined the position of our Institute in the Faculty of Electronics and Information Technology. Thank you very much for your cooperation in creative development of the Institute.

Professor Paweł Szczepański



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1. GENERAL INFORMATION

1.1. Board of Directors

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1.2. Organisation of the Institute and Areas of its Activities

The Institute of Microelectronics and Opto-electronics is a part of the Faculty of Electronics and Information Technology – the largest Faculty of the Warsaw University of Technology. Our Institute consists of five divisions:

- Microelectronics and Nanoelectronics Devices Division;
- VLSI Engineering and Design Automation Division;
- Image and Microwave Photonics Division;
- Microsystem and Electronic Material Technology Division;
- Optoelectronics Division.

During the past thirty-three years of research in the area of microelectronics and optoelectronics the Institute has built its competence in:

- modelling of physical effects in modern semiconductor devices;
- silicon processing and its modelling, non-standard dielectric layer deposition techniques;
- developing methods and measurement systems to characterize electronic materials and devices;
- generation of microwaves, microwave measurement techniques, and numerical methods for electromagnetism;
- processing, designing, optimisation techniques and development of VLSI (very large scale integration of circuits) computer-aided tools;
- design and technology of thick-film hybrid circuits, fabrication of thick-film microsystems;
- modelling and design of sensors and optical-waveguide microsystems;
- laser physics (Fabry-Perot and distributed feedback lasers), laser spectroscopy of solid state active materials, and applications of lasers in medicine, manufacturing and telecommunications;
- fabrication and characterisation of optoelectronics elements and devices including fibre sensors, photovoltaics;
- silicon carbide processing for high-temperature, high-power and high-frequency electronics
- computer-aided design of photo electronic 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 projects financed by the State Committee for Scientific Research and those within 7^{th} UE Framework Programme.
The results of our scientific activities were published in many papers submitted to prestigious international scientific journals and presented at national and mostly at international conferences in the form of communications as well as the invited lectures.

1.3. Microelectronics and Nanoelectronics Devices Division

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 microcontrollers.

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Andrzej Mazurak, Ph.D.	Assistant Professor
Robert Mroczyński, Ph.D.	Assistant Professor
Sławomir Szostak, Ph.D.	Assistant Professor
Jakub Walczak, Ph.D.	Assistant Professor
Agnieszka Zaręba, M.Sc.	Assistant Professor
Jan Gibki, Ph.D.	Senior Lecturer

Junior academic staff

Jakub Jasiński, M.Sc.	Assistant
Kamil Ber, M.Sc.	Ph.D. Student
Dominik Tanous, M.Sc.	Ph.D. Student
Piotr Wiśniewski, M.Sc.	Ph.D. Student

Technical and administrative staff

Witold Ciemiewski
Kazimierz Dalbiak,
Krzysztof Krogulski

To name a few examples of its research topics:

- Diagnostics and characterisation of properties of single and double insulating layers (gate stack including ultra-thin 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 ultra-thin oxide;
- New materials (semiconductors and dielectrics) for microelectronics applications (e.g.: silicon carbide, gallium nitride, silicon-germanium, germanium)
- Theoretical studies on MOS-SOI (silicon-on-insulator) and Si:Ge (silicon-germanium) MOS structure physics (modeling of devices behaviour and modeling for characterisation and diagnostics);
- Nanoelectronic phenomena and devices (e.g. tunnel and resonance tunnel diodes and transistors, Coulomb blockade diode, single-electron transistors, memories);
- PECVD deposition of ultra-thin dielectric layers for MOSFET gate dielectric (SiO_2, Si_3N_4, SiOxNy);
- Ultra-shallow implantation from r.f. plasma;
- Very low temperature processing of test structure;
- Fabrication of ultrathin amorphous silicon layers by PECVD
- Fabrication of double barrier structures and devices;
- MEMS/MOEMS processing;
- Silicon photonic devices fabrication.

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1.4. VLSI Engineering and Design Automation Division

The research carried out in the division falls into several main areas: development of IC design methodologies and tools, design of digital and analog integrated circuits for nonstandard demanding applications, investigations of new devices and circuits for future generations of microelectronic systems.

Head of the Division

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Tomasz Borejko, Ph.D.	Assistant Professor
Grzegorz Janczyk, Ph.D.	Assistant Professor
Zbigniew Jaworski, Ph.D.	Assistant Professor
Dominik Kasprowicz, Ph.D.	Assistant Professor
Marek Niewiński, Ph.D.	Assistant Professor
Andrzej Wielgus, Ph.D.	Assistant Professor
Adam Wojtasik, Ph.D.	Assistant Professor

Junior academic staff

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Mariusz Derlecki, M.Sc.	Ph.D. Student
Andrzej Grodzicki, M.Sc.	Ph.D. Student
Jakub Kopański, M.Sc.	Ph.D. Student
Aleksander Koter, M.Sc.	Ph.D. Student
Michał Łukaszewicz, M.Sc.	Ph.D. Student
Krzysztof Marcinek, M.Sc.	Science Assistant, Ph.D. Student
Piotr Mierzwiński, M.Sc.	Ph.D. Student
Krzysztof Siwiec, M.Sc.	Science Assistant, Ph.D. Student
Michał Staniewski, M.Sc.	Ph.D. Student

Science research staff

Paweł Narczyk, M.Sc.	Science Assistant

Technical and administrative staff

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

Current research projects in the Division include:

- 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,
- development of CAD tools for integrated circuit design and verification, with special emphasis on analog full custom ASICs design,
- design of digital, analog and mixed signal VLSI circuits for special applications such as innovative AD converters, data processing in physical experiments and medical equipment, RF front ends for wireless data transmission etc.,
- modeling and control of leakage currents in nanometer digital circuits,
- investigations and development of new VESTIC microelectronics technology.

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1.5. Image and Microwave Photonics Division

The main areas of activity of the Division are education and research, both in the field of the technology of electronic imaging devices, digital image processing, propagative electronics and microwave photonics.

Head of the Division

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

Junior academic staff

Grzegorz Kurzejamski, M.Sc.	Ph.D. Student
Krzysztof Madziar, M.Sc.	Assistant
Jacek Zawistowski, M.Sc.	Ph.D. Student

Technical and administrative staff

Jerzy Domański, M.Sc.
Bożena Janus

Members of the academic staff are involved in research and development works on:

- theoretical principles of image modeling, processing and analysis;
- application of image processing methods for diagnostic control and measurement systems in industry, medicine, research and commerce;
- image acquisition in polarization imaging systems and optical image processing;
- 3D Vision methods and algorithms;
- electro optic effects in liquid crystals and their applications to LCD and photo refractive phenomena in liquid crystals;
- 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;
- modelling and computer aided design of microwave devices and circuits;
- controlling of microwave circuits parameters by means of optical signals;
- investigations and modeling of optical-microwave frequency conversion processes;
- modeling of optically controlled microwave devices, as photodiodes, photovaractors, phototransistors;
- modeling of optoelectronic and microwave devices for data transmission networks.

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1.6. Electronic Materials and Microsystem Technology Division

The research activity of the Division concentrates on optoelectronics (e.g., measuring systems using fiber optic sensors), and hybrid technologies, and the development of wide bandgap semiconductor technology in the design, modeling and manufacturing of microelectronic devices operating at high temperatures, including power semiconductor devices. Fundamental and applied research are carried out. Research groups are organised for defined tasks.

Head of the Division

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Ryszard Kisiel, Ph.D., D.Sc.	Professor
Mateusz Śmietana, Ph.D.	Professor
Mikołaj Baszun, Ph.D., D.Sc.	Assistant Professor
Piotr Firek, Ph.D.	Assistant Professor
Jerzy Kalenik, Ph.D.	Assistant Professor
Stanisław Pietruszko, Ph.D.	Assistant Professor
Aleksander Werbowy, Ph.D.	Assistant Professor

Junior academic staff

Tymoteusz Ciuk, M.Sc.	Ph.D. Student
Magdalena Dominik (Szymańska), M.Sc.	Ph.D. Student
Anna Katarzyna Dębowska, B.Sc.	Ph.D. Student
Jakub Grochowski, M.Sc.	Ph.D. Student
Piotr Knyps, M.Sc.	Ph.D. Student
Krzysztof Krogulski, M.Sc.	Ph.D. Student
Krystian Król, M.Sc.	Ph.D. Student
Norbert Kwietniewski, M.Sc	Science Assistant
Mateusz Mroczkowski, M.Sc.	Science Assistant, Ph.D. Student
Michał Myśliwiec, M.Sc.	Ph.D. Student
Bartłomiej Stonio, M.Sc.	Ph.D. Student
Andrzej Taube, M.Sc.	Ph.D. Student
Michał Waśkiewicz, M.Sc	Science Assistant, Ph.D. Student

Science research staff

Mariusz Sochacki, Ph.D. Assistant Professor

Technical and administrative staff

Ryszard Biaduń,
Katarzyna Trzaskowska.

The main research areas are as follows:

- the use of graphene in the design of photodetectors for the far-infrared range with the electrical and optical characterization of graphene produced on different substrates, or a transferred onto the substrate;
- the design, modeling and fabrication of microelectronic devices based on silicon carbide (SiC) technology;
- the development of electrical characterization methods for the determination of energy distribution of traps in MOS devices;
- designing, modeling and fabrication of microelectronic and optoelectronic devices using transparent dielectric and conductive oxides Fabrication, and characterization of high-k dielectric layers;
- fabrication and investigation of the following optoelectronic devices: integrated passive and active light wave guiding structures (modulators, bistable switches etc.) and fibre optic sensors;
- computer engineering for fibre optics;
- new Surface Mount Technologies SMT on printed circuit boards;
- application of thin and thick film technology in hybrid devices and thick film sensors fabrication;
- investigation of the electronic structure, stability and optical properties of amorphous silicon and its devices (thin film transistors, solar cells, etc.);
- Design, fabrication and characterization of multi-junction photovoltaic cells with high energy efficiency;
- design and monitoring of photovoltaic systems, strategy for development of photovoltaics;
- electronic packaging technology;
- plasma deposition of nanocrystalline diamond (NCD), diamond-like carbon (DLC) thin films and their application in fibre optic and waveguide sensing structures.

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1.7. Optoelectronics Division

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, new optical waveguide materials and structures, laser spectroscopy, laser construction and laser applications in medicine and air pollution monitoring.
Photovoltaics laboratory, as a part of the Division, serves as a focal point for conducting and stimulating research and demonstration activities, educating students, organizing technical meetings, workshops, symposia and conferences, disseminating information and addressing environmental issues.

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Marcin Kaczkan, Ph.D.	Assistant Professor
Jerzy Kęsik, Ph.D.	Assistant Professor
Agnieszka Mossakowska- -Wyszyńska, Ph.D.	Assistant Professor
Anna Tyszka-Zawadzka, Ph.D.	Assistant Professor
Piotr Warda, Ph.D.	Assistant Professor

Junior academic staff

Krzysztof Anders, M.Sc.	Design Engineer, Ph.D. Student
Zuzanna Boruc, M.Sc.	Ph.D. Student
Bartosz Fetliński, M.Sc.	Ph.D. Student
Anna Jusza, M.Sc.	Design Engineer, Ph.D. Student
Łukasz Ostrowski, M.Sc.	Ph.D. Student
Tadeusz Tenderenda, M.Sc.	Ph.D. Student

Technical and administrative staff

Stanisław Stopiński, Ph.D.	R&D Specialist
Maciej Juźwik, M.Sc.	

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

The main research activity of the Division comprises:

- solid state laser construction and their applications in materials processing;
- spectroscopic research of new laser materials, investigation of the excitation processes in rare earth doped dielectric materials, research of blue up-conversion laser structures, waveguide lasers;
- theoretical research of laser generation in planar, fibre and hollow waveguide gas lasers, analysis of light generation in DFB (distributed feedback) structures, photonic crystals structures and in lasers with non-linear optical elements, investigation of the statistical properties of the light generated in various laser structures;
- nano-optical structures and photonic band-gap materials;
- 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;
- spectroscopic and theoretical research of light generation in silicon photonic lasers.

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1.8. Statistical Data

SPECIFICATION	2013	2014	DIFFERENCE
Academic staff	**79**	**81**	**+3**
Tenured professors	9	9	0
Professors	6	8	+2
Docent	1	1	0
Assistant professors	30	27	-3
Senior lecturers	4	2	-2
Assistants and Ph.D. students	29	35	+6
Science research staff	**5**	**7**	**+2**
Technical and Administrative staff	**24**	**23**	**-1**
Teaching activities	**72**	**72**	**0**
Basic courses	32	36	+4
Advanced courses	23	19	-4
Special courses	17	17	0
Research projects	**39**	**39**	**-1**
Granted by the University	8	7	-1
Granted by State Institutions	26	28	+2
Granted by International Institutions	4	3	-1
Others projects	1	2	+1
Degrees awarded	**54**	**49**	**-5**
D.Sc. degrees	1	1	0
Ph.D. degrees	2	2	-1
M.Sc. degrees	17	18	+1
B.Sc. degrees	34	28	-6
Publications	**219**	**112**	**-107**
Sci.-tech. books	16	5	-11
Sci.-tech. papers in journals	77	47	-30
Sci.-tech. papers in conference proceedings	126	60	-66
Patents	**7**	**3**	**-4**
Conferences	**24**	**54**	**+30**
Awards	**14**	**6**	**-8**

Microelectronics and Nanoelectronics Devices Division

2. STAFF

2.1. Senior Academic Staff

Mikołaj Baszun, M.Sc. ('69), Ph.D. ('77), Computer engineering, Assistant Professor, full time, Electronic Materials and Microsystem Technology Division, Member of Polish Acoustics Association ('01), WUT Rector's Collective Award ('06), President's of the Republic of Poland Gold Medal for Long-Term Service ('08).

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Romuald B. Beck, M.Sc. ('76), Ph.D. ('82), D.Sc. ('96), Microelectronics, Electronics, Professor, full time, Head of Microelectronics and Nanoelectronics Devices Division ('04–), Leader of the Technology, Diagnostics and Modelling Group ('85–), Vice President of the Microelectronics Section of the Electronics and Telecommunication Committee of the Polish Academy of Sciences ('93–'08), Member od Programme Committee of: Diagnostics & Yield Conference ('88-), Member of the Faculty Council ('96–), Co-chairman ('03–), Chairman ('06); Member of Programme Committee of ELTE ('84, '04, '07, '13), Member of Technical Programme Committee ESSDERC ('05–'13), Senior Member of IEEE ('97–'06), Head of CEZAMAT Project Office ('08–'12), Vice-President for Scientific Affairs of CEZAMAT PW Ltd ('12–)., WUT Rector's Collective Award for Scientific Achievements ('06,'08,'12).

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STAFF

Andrzej Jakubowski, M.Sc. ('63), Ph.D. ('73), D.Sc. ('83), Electronics, Microelectronics, Full Professor, part time, Microelectronics and Nanoelectronics Devices Division ('01–), Member of the Faculty Council ('83–), Head of the Insititute of Microelectronics and Optoelectronics ('04–'08), Head of the Institute of Electron Technology in Warsaw ('89–'92), Chairman of the Section of Applied Research of Science and Technical Progress Government Committee ('90–'91), Head of Microelectronics Division ('84–'01), Member of Faculty Council ('77–'14), Member and Vice-Chairman of the Electronics and Telecommunications Committee of the Polish Academy of Sciences, Head of its Microelectronics Section ('88–'03), Pożaryski Award for Scientific Publications ('86, '96), Member of Programme Committee of ELTE ('84–), MiEL ('94–), IWSPD ('96–), MIXDES ('97–), IEEE ICCDS ('02–), Chairman of "Diagnostic and Yield" ('88–), Editor-in-chief of "Electron Technology" ('90–'94), WUT Rector's Collective Award for Scientific Achievements ('06, '08, '09), WUT Rector's Collective Award for Educational Achievements ('10), Dean's Representative for Development of Young Staff ('12–), Doctor Honoris Causa of Lodz University of Technology ('14).

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2.2. Junior Research Staff

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2.4. Technical and Administrative Staff

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Katarzyna Trzaskowska	M.A.	Administrative Specialist	+48 22 2347776	236 GR

VLSI Engineering
and Design Automation Division

3. TEACHING ACTIVITIES

3.1. Basic Courses

[Edu1] **Algorithms and Data Structures** (Algorytmy i struktury danych), **AISDE**, Adam Wojtasik

[Edu2] **Application of Matlab in Calculation Methods** (Matlab w zastosowanych metodach obliczeniowych) **MZMO**, Mikołaj Baszun

[Edu3] **Computer-Aided Design of Printed-Board Circuits** (Projektowanie obwodów drukowanych), **PADS**, Ryszard Kisiel, Jerzy Kalenik

[Edu4] **Digital Circuits** (Układy cyfrowe), **UCYF**, Elżbieta Piwowarska

[Edu5] **Electronic Elements and Circuits** (Elementy i układy elektroniczne), **ELIU**, Andrzej Pfitzner

[Edu6] **Electronic Elements and Circuits – Laboratory** (Elementy i układy elektroniczne – laboratorium), **ELIUL**, Andrzej Pfitzner

[Edu7] **Electronics 1** (Elektronika 1), **ELE1**, Andrzej Jakubowski, Sławomir Szostak

[Edu8] **Electronics 2** (Elektronika 2), **ELE2**, Zbigniew Pióro

[Edu9] **Equipment – Programming Synthesis of Digital Systems** (Synteza sprzętowo – programowa systemów cyfrowych), **SSP**, Elżbieta Piwowarska

[Edu10] **Fields and waves**, (Pola i fale), **POFA**, Jerzy Piotrowski

[Edu11] **Fundamentals of Circuit and System Technology** (Podstawy technologii układów i systemów), **PTUIS**, Romuald Beck

[Edu12] **Fundamentals of Lasers** (Lasery – kurs podstawowy), **LKP**, Paweł Szczepański

[Edu13] **Fundamentals of Microelectronics** (Podstawy mikroelektroniki), **PMK**, Wiesław Kuźmicz

[Edu14] **Fundamentals of Microprocessor Techniques** (Podstawy techniki mikroprocesorowej), **TMIK**, Lidia Łukasiak

[Edu15] **Fundamentals of Microwave Engineering** (Podstawy techniki w.cz.), **TWCZ**, Bogdan Galwas

[Edu16] **Fundamentals of Photonics** (Podstawy fotoniki), **FOT**, Michał Malinowski

[Edu17] **Fundamentals of Solid State Electronics** (Elektronika ciała stałego), **ELCS**, Jan Szmidt, Witold Pleskacz

[Edu18] **Hybrid Systems** (Układy hybrydowe), **UKH**, Ryszard Kisiel

[Edu19] **Introduction to Microsystems** (Wstęp do mikrosystemów), **WMS**, Zbigniew Pióro

[Edu20] **Introduction to Numerical Methods** (Wstęp do metod numerycznych), **WDMNM**, Jerzy Krupka

[Edu21] **Introduction to Programming** (Podstawy programowania), **PRM**, Michał Borecki

[Edu22] **Introduction to the UNIX System** (Użytkowanie systemu UNIX), **USUX**, Andrzej Wielgus

[Edu23] **Ligthwave Telecommunication** (Telekomunikacja optofalowa), **TEOP**, Bogdan Galwas

[Edu24] **Meeting 1 – Fundamentals of Information Technology** (Zjazd 1 – Podstawy technologii informacyjnej), **ZJ1Z**, Krzysztof Madziar

[Edu25] **Meeting 4 – Advanced Course Laboratory** (Zjazd 4 – Zaawansowane laboratorium kierunkowe), **ZJ4Z**, Agnieszka Szymańska

[Edu26] **Methods of Image Acquisition and Processing for Photography**, (Techniki rejestracji i obróbki obrazów w fotografii), **TROOF**, Marek Sutkowski

[Edu27] **Object Programming** (Programowanie obiektowe), **PROE**, Adam Wojtasik

[Edu28] **Operating Systems** (Systemy operacyjne), **SOE**, Andrzej Wielgus

[Edu29] **Optoelectronic Devices and Systems** (Elementy i systemy optoelektroniczne), **ESO**, Marcin Kaczkan

[Edu30] **Physical Fundamentals of Information Processing** (Fizyczne podstawy przetwarzania informacji), **FPPI**, Bogdan Majkusiak

[Edu31] **Physics** (Fizyka ogólna), **FOM**, Mikołaj Baszun

[Edu32] **Programming for mobile Apple iOS and MacOS X** (Programowanie dla systemów: mobilnego iOS oraz MacOS X), **APIOS**, Adam Wojtasik

[Edu33] **Programming microcontrollers in C language** (Programowanie mikrokontrolerów w języku C), **PMIK**, Sławomir Szostak

[Edu34] **Semiconductor Devices** (Przyrządy półprzewodnikowe), **PP**, Andrzej Jakubowski, Andrzej Pfitzner

[Edu35] **Semiconductor Devices** (Przyrządy półprzewodnikowe), **PPRM**, Antoni Siennicki

[Edu36] **Solid-State Physics** (Fizyka ciała stałego), **FCSM**, Jan Szmidt, Agnieszka Zaręba

3.2. Advanced Courses

[Edu37] **Advanced Technologies for Silicon Microelectronics and Photonics** (Zaawansowane technologie mikroelektroniki i fotoniki krzemowej), **ZTM**, Romuald Beck

[Edu38] **Advanced Semiconductor Structures** (Zaawansowane struktury półprzewodnikowe) **ZSP**, Andrzej Jakubowski, Lidia Łukasiak

[Edu39] **Analog Integrated Circuit Design for VLSI Systems** (Projektowanie bloków analogowych dla systemów VLSI) **PSSA**, Wiesław Kuźmicz

[Edu40] **Characterization of Materials for Microelectronics** (Charakteryzacja materiałów dla mikroelektroniki) **CHA**, Jan Szmidt

[Edu41] **Computational Methods in Microelectronics and Photonics** (Metody obliczeniowe w mikroelektronice i fotonice), **MOBI**, Andrzej Pfitzner, Agnieszka Mossakowska-Wyszyńska

[Edu42] **Digital Image Processing** (Cyfrowe przetwarzanie obrazów), **CPOO**, Piotr Garbat

[Edu43] **Electronic and Photonic Devices for Telecommunication** (Przyrządy elektroniki i fotoniki dla telekomunikacji), **PEFT**, Bogdan Galwas

[Edu44] **Fiber-Optic Communication** (Komunikacja światłowodowa), **KOS**, Ryszard Piramidowicz

[Edu45] **Fundamentals of Nanoelectronics and Nanophotonics** (Podstawy nanoelektroniki i nanofotoniki), **NANO**, Bogdan Majkusiak, Paweł Szczepański

[Edu46] **Integrated and Logic Circuits for Optoelectronics** (Zintegrowane układy optoelektroniczne i optyczne układy logiczne), **ZOUL**, Michał Malinowski

[Edu47] **Introduction to Digital VLSI System Design** (Projektowanie scalonych systemów cyfrowych), **PSSC**, Elżbieta Piwowarska

[Edu48] **Laboratory of Fundamentals of Nanoelectronics and Nanophotonics** (Pracownia podstaw nanoelektroniki i nanofotoniki), **PNAN**, Bogdan Majkusiak, Paweł Szczepański

[Edu49] **Lasers** (Lasery) **LAS**, Paweł Szczepański

[Edu50] **Microsystems Engineering** (Inżynieria mikrosystemów) **MIK**, Ryszard Kisiel

[Edu51] **Monte Carlo Methods – Fundamentals and Applications** (Metody Monte Carlo – podstawy i zastosowania), **MMC**, Marek Niewiński

[Edu52] **Nanotechnologies** (Nanotechnologie), **NAN**, Jan Szmidt

[Edu53] **Photovoltaic Systems** (Systemy fotowoltaiczne), **SFOT**, Stanisław Pietruszko

[Edu54] **Semiconductor Photonic Devices** (Fotoniczne przyrządy półprzewodnikowe), **FPP**, Paweł Szczepański

[Edu55] **VLSI System Design** (Projektowanie systemów scalonych w technice VLSI), **PSSV**, Wiesław Kuźmicz, Zbigniew Jaworski

3.3. Courses in English

[Edu56] **Electronics 1, EELE1**, Bogdan Majkusiak

3.4. Courses for other Faculties

[Edu57] **Bases of Automation, Faculty of Management** (Podstawy automatyzacji, Wydział Zarządzania), **POAUT**, Mikołaj Baszun

[Edu58] **Electromagnetic Compatibility, Faculty of Management** (Kompatybilność elektromagnetyczna, Wydział Zarządzania), **KOMEL**, Jerzy Piotrowski

[Edu59] **Electronic Circuits and the Introduction to Microelectronics, Faculty of Management** (Układy elektroniczne i wstęp do mikroelektroniki, Wydział Zarządzania), **UEMIK**, Sławomir Szostak

[Edu60] **Electronic Devices, Faculty of Management** (Elementy elektroniczne, Wydział Zarządzania), **ELEME**, Lidia Łukasiak

[Edu61] **Electronic Equipment Assembly Processes, Faculty of Management** (Inżynieria montażu urządzeń elektronicznych, Wydział Zarządzania), **IMUEL**, Ryszard Kisiel

[Edu62] **Electronic Equipment Design Techniques, Faculty of Management** (Techniki konstrukcji urządzeń elektronicznych, Wydział Zarządzania), **TEKUE**, Ryszard Kisiel

[Edu63] **Electronic Material and Structure Production Engineering, Faculty of Management** (Inżynieria produkcji materiałów i struktur elektronicznych, Wydział Zarządzania), **INMAS**, Mikołaj Baszun

[Edu64] **Electronics 1, Faculty of Mechatronics** (Elektronika 1, Wydział Mechatroniki), **ELE1**, Andrzej Jakubowski, Sławomir Szostak

[Edu65] **Electronics 2, Faculty of Mechatronics** (Elektronika 2, Wydział Mechatroniki), **ELE2**, Zbigniew Pióro

[Edu66] **Energy Conditioning and Storage Laboratory, Faculty of Physics** (Laboratorium przetwarzania i magazynowania energii, Wydział Fizyki) **LPME**, Michał Malinowski

[Edu67] **Fundamentals of Devices, Circuits and Systems Technology, Faculty of Management** (Podstawy technologii przyrządów, układów i systemów, Wydział Zarządzania), **POTPU**, Robert Mroczyński

[Edu68] **Information Techniques and Systems, Faculty of Transport** (Technologie i systemy informatyczne, Wydział Transportu), **TISI**, Jarosław Dawidczyk

[Edu69] **Laser Technology, Faculty of Physics** (Technika Laserów, Wydział Fizyki), **TL**, Ryszard Piramidowicz

[Edu70] **Methods of Electronic Element Diagnostics, Faculty of Management** (Metody diagnostyki elementów elektronicznych, Wydział Zarządzania), **MEDEL**, Jan Gibki

[Edu71] **Photonic Devices, Faculty of Management** (Elementy fotoniczne, Wydział Zarządzania), **ELFOT**, Ryszard Piramidowicz

[Edu72] **Printed Cricuit Board Design, Faculty of Management** (Projektowanie obwodów drukowanych, Wydział Zarządzania), **PRODRU**, Jerzy Kalenik

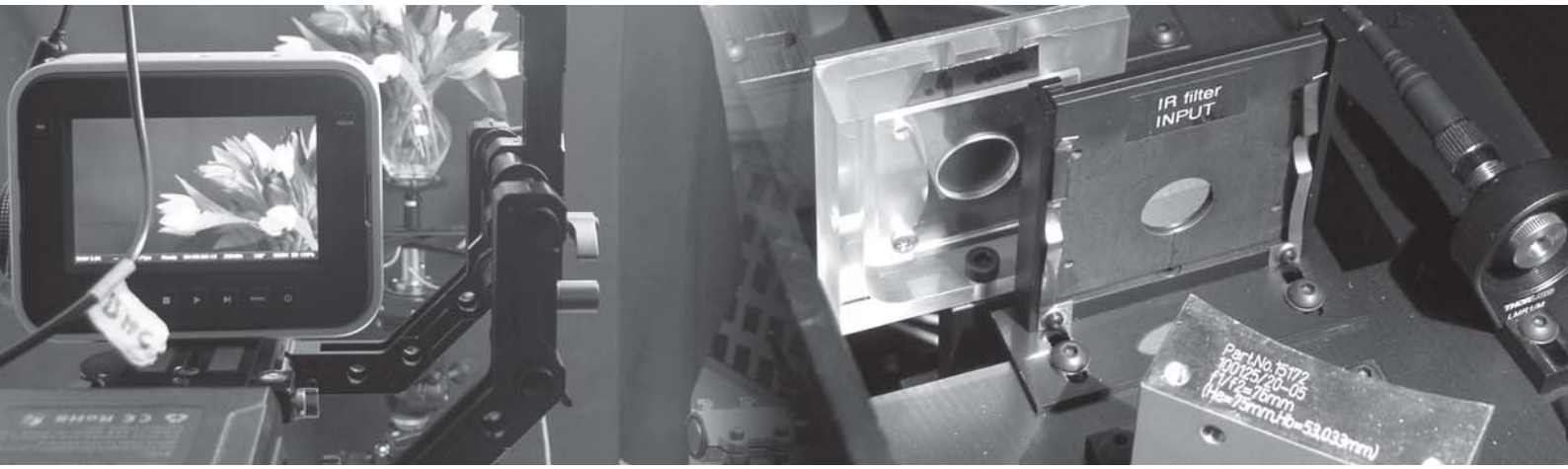

Image and Microwave
Photonics Division

4. RESEARCH PROJECTS

Project definitions and descriptions – prepared by Project Leaders.

4.1. Projects Granted by the University

[Pro1] **The Development of Design, Processing and Testing Methods of the Electronic Devices and Materials for Microelectronics and Optoelectronics** (Rozwój metod wytwarzania i badania materiałów oraz modelowania i charakteryzacji przyrządów w dziedzinie mikroelektroniki i optoelektroniki), project leader: Paweł Szczepański, June 2013–May 2014, **sub-projects**:

[Pro1.1] **Constructions, technology and materials for microsystem sensors techniques** (Konstrukcje, technologie i materiały dla mikrosystemowych technik sensorowych), project leader: Jan Szmidt

Statute grant of ZTMiME "Constructions, technology and materials for microsystem sensors techniques" consists of two tasks. First task is „Electronic materials characterization in controlled environment with microwave methods". Second task is „Microsystem construction development for use in biomedical diagnostic."

In the area of the first task, we have investigated resistivity changes introduced on the high-resistivity p-type silicon wafer by the irradiation with deuteron beam with an energy of 4.4 GeV performed in the NUCLOTRON superconducting accelerator. Two contactless techniques were used for the measurements of resistivity changes: namely the microwave split post dielectric resonator (SPDR) technique and capacitance measurements in the frequency domain. The first technique allows for resistivity measurements in the plane of the wafer, while the second one in the direction perpendicular to the wafer. The resistivity map obtained with the SPDR technique enabled us to obtain a permanent fingerprint of the accelerator beam intensity profile. It has been shown that after the irradiation, the material resistivity increased to ˜3.9 $\times$ 105 Ω cm in the wafer region exposed to the maximum beam intensity. Complementary studies of the properties and concentrations of radiation deep-level defects were performed by the high-resolution photo-induced current transient spectroscopy (HRPITS). These studies have shown that the irradiation of the high resistivity silicon with 4.4-GeV deuterons results in the formation of several types of deep-level defects responsible for the charge compensation.

In the area of the second task we develop new type of large area photodiode. We describe the construction, fabrication and properties of large-area ultra violet detector that is transparent in the visible range. The device was made on n-type 4H SiC substrate with a double epitaxial layer in which aluminum was implanted to form a p-n junction close to the surface, and a SiO_2 layer was formed for passivation, without a guard ring. The design of the top and bottom electrodes of 4 mm diameter UV sensitive area allows not less than 20% visible range transmission. This transmission was measured across sensitive area of examined devices and was only 5% lower than that of the substrate before implantation and electrodes deposition. We show the implementation of developed photodiode in ultra violet range radiation, which has important applications in sensing techniques, in particular for biochemical sensing of mixture parameters. At the first step of sensing examinations of fatty acids composition characterization we perform investigation of their parameters in capillary microsystem.

[Pro1.2] **Integrated radio frequency voltage controlled oscillator design automation methods for submicrometer CMOS technologies** (Metody automatyzacji projektowania scalonych układów generatorów przestrajanych napięciem na częstotliwości radiowe realizowanych w submikrometrowych technologiach CMOS), project leader: Andrzej Pfitzner

The work includes research and development of integrated radio frequency voltage controlled oscillator design automation methods for submicrometer CMOS technologies. Design automation of analog circuits, such as voltage controlled oscillators, is a relevant and complex research task. A lot has been done in the area of digital circuit design automation, which resulted in substantial design time reduction. The development of design automation methods in analog circuit domain allows for reducing design time in this area, as well.

Design automation methods are implemented as algorithms, which will be used to develop a design automation tool. The tool, based on input specification given by a designer, can automatically create electrical schematic and will find all parameters of semiconductor devices used in the circuit. The tool is to integrated with commercial software from Cadence, used for integrated circuit design, and will be implemented as Matlab functions.

[Pro1.3] **Modeling, elaboration and investigation of micro- and nano-photonic structures and characterization of new optically active materials** (Modelowanie, opracowanie i badanie mikro- i nano- struktur fotonicznych oraz charakteryzacja nowych ośrodków optycznie aktywnych), project leader: Michał Malinowski

The interest in increasing signal speed, lowering optical losses and reducing power requirements led to the integration and miniaturization of the photonic components and systems for optical communication. The project is focused on spectroscopic investigation and optical modeling of passive and active micro-photonic devices such as; planar and fiber waveguides, amplifiers and lasers, development of optical modeling tools for nonlinear optical high-finesse (ring, DFB/DBR, photonic crystal) resonators, power optimization and quantum noise analysis of amplifiers and lasers, laser action studies in new solid-state lasers, including waveguide and photonic crystal structures.

The program includes spectroscopic investigations of rare-earth activated solids for technological, sensing and biological applications. This concerns bulk monocrystalline, nanocrystalline, ceramic, polymer and glassy matrix for various phosphors, including white light and up-conversion phosphors, sensors, photovoltaics, lasers and amplifiers.

[Pro1.4] **Modification of properties of MOS test structures with high-K gate dielectric layer** (Modyfikacja właściwości struktur testowych MOS z dielektrykami bramkowymi w postaci warstw o wysokiej wartości przenikalności elektrycznej (high-k)), project leader: Robert Mroczyński

The main objective of this work is to examine the possibility of modifying of electro-physical properties of MOS structures with high-k permittivity dielectrics. The modification will be based on medium and high temperature annealing in a controlled atmosphere on the fabricated dielectric films and MOS structures. Research and analysis of the thermal stability is of the utmost importance for MOS structures based on high-k layers for modern semiconductor devices. The development of such technology will result in the ability to perform new research tasks, prepare specialized Technological Laboratory of Microelectronic and Nanoelectronic Devices Divison (ZPMiN) for the fabrication of MOS structures/MOSFET in self-aligned technology, as well as preparation a services offer for internal and external partners.

[Pro1.5] **The study of nonlinear phenomena in a Mach-Zender modulator for microwave photonics systems and optimization of 3D imaging in the THz range realized in the reflectance system** (Badanie zjawisk nieliniowych w modulatorze Macha-Zendera w układach fotoniki mikrofalowej oraz optymalizacja zobrazowań 3D w zakresie THz realizowana w układzie odbiciowym), project leader: Janusz Parka

The aim of proposed project is to investigate non-linear behaviour of Mach-Zehnder (MZ) modulators. Such effects, caused by MZ modulator's non-linear transfer characteristics can be used for optical-microwave mixing, frequency multiplication etc. An analytical non-linear model of MZ Modulator with experimental verification of its non-linear behaviour will be presented.

[Pro2] The Development of Design, Processing and Testing Methods of the Electronic Devices and Materials for Microelectronics and Optoelectronics (Rozwój metod wytwarzania i badania materiałów oraz modelowania i charakteryzacji przyrządów w dziedzinie mikroelektroniki i optoelektroniki), project leader: Paweł Szczepański, May 2014–May 2015, **sub-projects**:

[Pro2.1] **Design, materials and technologies for microsystems in sensor technology** (Konstrukcje, materiały i technologie dla mikrosystemowych technik sensorowych), project leader: Jan Szmidt, co-workers: Michał Borecki, Aleksander Werbowy, Ryszard Kisiel, Mariusz Sochacki, Jerzy Krupka, Piotr Firek, Jerzy Kalenik, Mateusz Śmietana

[Pro2.2] **Investigations of nonlinear phenomena in Mach-Zender modulator in microwave photonic systems and optimization of 3D images in THz range realized in reflected (transmitted) system** (Badanie zjawisk nieliniowych w modulatorze Macha-Zendera w układach fotoniki mikrofalowej oraz opymalizacja zobrazowań 3D w zakresie THz realizowana w układzie odbiciowym (transmisyjnym)), project leader: Janusz Parka, co-workers: J. Woźnicki, P. Garbat, K. Madziar, M. Sutkowski, P. Witoński, J. Piotrowski, A. Szymańska, J. Domański

In the first part of this work, nonlinear properties of Mach-Zender transmission characteristics are investigated. This phenomena was used in optoelectronic oscylators in microwave range. In the second part of this work, the possibility of optimization of 3D images for application to THz range. Investigations are done using data from TDS (Time Domain Spectrosopy) for structures of chosen multilayer materials. Amplitude and phase of TDS signal is changed from different thickness of the layers. Final image was obtained from correlation function obtained for each pixel of obtained image.

[Pro2.3] **Modeling and investigation of optical materials, photonic structures and circuits** (Modelowanie, opracowanie i charakteryzacja materiałów, struktur i układów fotonicznych), project leader: Michał Malinowski

The project includes spectroscopic investigations of rare-earth activated solids for technological and biological applications. This concerns bulk, nanocrystalline and waveguide matrix for lasers and amplifiers, various phosphors, including white light and up-conversion phosphors, sensors, and photovoltaic conversion.

The project is focused on development of modeling tools for optical passive and active micro-photonic devices such as; planar and fiber waveguides, amplifiers and lasers, nonlinear optical high-finesse (ring, DFB/DBR, photonic crystal) resonators, power optimization and quantum noise analysis of amplifiers and lasers, laser action studies in new solid-state lasers, including waveguide and photonic crystal structures.

[Pro2.4] **Modification of properties of MOS test structures with high permittivity gate dielectric layers** (Modyfikacja właściwości struktur testowych MOS z dielektrykami bramkowymi w postaci warstw o wysokiej wartości przenikalności elektrycznej (high-k)), project leader: Robert Mroczyński

The main objective of this work is to examine the possibility of modifying the electro-physical properties of MOS structures with gate dielectric in the form of high-permittivity material. The influence of the thermal treatment onto the quality, stability and reliability of semiconductor structures will be examined and described. The proposed work is experimental. The analysis of the thermal stability of MOS structures is of the most importance for the application of high-k-based MOS devices in nowadays semiconductor structures.

[Pro2.5] **The methods of design automation for calibration of analog and RF integrated circuits implemented in submicron CMOS technologies** (Metody automatyzacji projektowania scalonych układów przestrajanych napięciem generatorów RF realizowanych w submikrometrowych technologiach CMOS), project leader: Andrzej Pfitzner; main contractors: Zbigniew Jaworski, Mariusz Derlecki; co-workers - other members of the VLSI Engineering and Design Automation Division.

In the framework of this project a calibration technique using back-gate biasing to minimize the mismatch impact in RF filters and operational amplifiers realized in 28 nm FD-SOI technology has been developed. This technique has been applied to an example sixth-order IF polyphase band-pass filter designs. The back-gate biasing concept has been also used to implement an autonomous offset compensation subcircuit for tranconductance operational amplifier. In addition, some analog blocks (comparator, capacitive divider based DAC) to be used in the design of adaptive ADC have been designed in the 28nm FD-SOI technology.

[Pro3] **Composite polymer fibers doped with metalo-organic Dy^{3+} complexes – new generation of optically active media** (Kompozytowe światłowody polimerowe domieszkowane kompleksami metalo-organicznymi jonów Dy^{3+} – nowa generacja ośrodków aktywnych optycznie), project leader: Anna Jusza, June 2014–March 2015

The main aim of the project is the development of manufacturing technology and investigation of luminescent properties of a new optically active materials – composite fibers based on polymer matrices doped with RE^{3+} metalo-organic complexes. It seems that RE^{3+} doped polymer lasers may create an interesting alternative for polymer lasers structures doped with organic dyes, however under the condition of overcoming problems with significant quenching of luminescence, being a result of interactions between RE^{3+} ions and highly energetic phonons, inherent for the polymer matrices. Doping of polymer material with RE^{3+} complexes, which would isolate active centers from the influence of matrix's phonons, may help solving this problem. Such composites enable combining the excellent lasing properties of solid state lasers and unique advantages of polymeric material – mechanical strength, flexibility and low cost of manufacturing. In particular, dysprosium doped materials allow for obtaining the efficient emission in the blue (478 nm) and yellow (575 nm) spectral range – rare in laser technology.

[Pro4] **Construction of Universal Prototyping Platform** (Budowa uniwersalnej platformy prototypującej przez Koło Naukowe Mikrosystemów ONYKS), Students Scientific Association Microsystem ONYKS, project leader: Jakub Jasiński, co-workers: Mariusz Ciszkowski, Mateusz Kamiński, Radosław Papis, Dominik Rękawek, Jacek Skarzyński, Michał Waśkiewicz, Piotr Waśkiewicz, May 2014–December 2014

The project aimed to build a multi-tasking platform that allows automation of many activities related to the performance of the finished prototype electronic devices.

The frame for universal prototyping platform was designed and assembled within the grant. Key modules required for operation were purchased and tested: stepper motors and drivers, that move head milling spindle, bearings, bushings and other mechanical components required for placing construction.

Constructed device allows testing in the field of numerical control milling, drilling and jointing of copper in the PCB.

[Pro5] **High power erbium fiber laser in all-fiber geometry** (Erbowy laser światłowodowy dużej mocy w geometrii all-fiber), project leader: Krzysztof Anders, June 2014–March 2015

The main aim of the project was to design, developed and examine operating parameters of prototype high-power erbium fiber laser generating ca. 5W watts in 1550 nm region. As part of the work resonator elements using fiber Bragg gratings, integrated laser diodes power supplies and temperature stabilization drivers were developed.

Performed experiments with the use of double clad fiber doped with erbium and ytterbium confirmed the possibility of obtaining efficient generation at 1545 nm. "All-fiber" FBG resonator has been developed enabling to obtain stable and fully fiber optic laser construction. Laboratory model exhibit the 5W output power and narrow spectral characteristics (FWHM <0.02 nm). Complete laser device was developed with particular emphasis on educational values.

[Pro6] **The generic GNSS processor architecture for satellite navigation systems** (Uniwersalna architektura procesora dla systemów nawigacji satelitarnej GNSS), project leader: Krzysztof Marcinek, November 2014–March 2015

The aim of this work was to continue the process of development of the proposed microprocessor systems design method. The taken Ph.D. dissertation thesis was verified through the extensive computer simulations on the high performance PC workstation. The obtained results were implemented on the developed microprocessor system using Xilinx ML-605 FPGA board. The project of the physical implementation of the designed microprocessor system was done using UMC CMOS 130 nm technology. The equipment purchased during the project was used to design and assembly of the evaluation PCB board for the manufactured ASIC containing parts of author's PhD thesis. The long-term objective of the project is to complete the text of the doctoral dissertation and obtain the PhD degree.

[Pro7] **Tunable lasers in photonic integration technology** (Przestrajalne źródła laserowe w technologii fotoniki scalonej), project leader: Stanisław Stopiński, June 2014–March 2015

The scientific objective of this project is focused on development of an integrated version of a tunable laser light source. Tunable lasers find application in fields such as telecommunications, fiber-optic sensor networks, optical spectroscopy, metrology and others. However, so far they are either realized as bulky devices or have short tuning range. The main goal of the project is realizing a miniaturized device tunable within a broad wavelength range. The devices are designed and fabricated in an InP-based generic integration technology, which is a radically new way of developing photonic devices. Characterization of the fabricated devices is performed in the Laboratory of Integrated Photonics, developed and equipped in the framework of the EU project FOTEH.

4.2. Projects Granted by the Ministry of Science and Higher Education

[Pro8] **Long-period grating structures for monitoring of deformation and defects in structural materials** (Struktury długookresowych siatek światłowodowych do monitorowania odkształceń i uszkodzeń materiałów konstrukcyjnych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Mateusz Śmietana, April 2012–March 2014

Precise monitoring of destruction or deformation in structural and composite materials is one of the biggest challenges of today's science. Applied there optical fiber sensors offer a number of desired properties, including small weight and size, low power consumption, E-M immunity, high sensitivity, resistance to corrosive chemicals and long-term robustness. Within the scope of the project there is foreseen designing, fabrication and investigations on long-period fiber gratings (LPFGs), optical structures showing sensitivity to tension, bending and twist – factors existing in structural materials. The LPFGs will be mounted on the surface of the materials as well as embedded in them.

[Pro9] **Modeling of light generation in photonic crystal lasers based on coupled mode theory** (Modelowanie generacji promieniowania w laserach z ośrodkiem aktywnym w postaci kryształu fotonicznego bazujące na teorii modów sprzężonych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Marcin Koba, April 2012–April 2014

This project aims to develop a numerical model for linear (i.e. threshold) and nonlinear (i.e. above threshold) analysis of two-dimensional (2D) photonic crystal (PC) lasers. The calculations are based on the coupled mode theory and the energy theorem. Analyzed structures are composed of circular pillars arranged in a square or triangular lattice, and enclosed within square regions. The PC structures are studied for electromagnetic field with TE and TM polarization.

[Pro10] **Neuronal cell cultures substrates with optical fiber sensors monitoring** (Podłoża do hodowli neuronalnych z monitorowaniem stanu hodowli przez czujniki światłowodowe), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Anna Katarzyna Dębowska (supervisor: Śmietana Mateusz), October 2014–July 2017

In this project we want to explore the possibilities of monitoring neuronal cultures with the use of optical fiber sensors. Studying *in vitro* cultured neuronal networks provides important data about the processes taking place in the human brain. However, the means of collecting the information about the propagation of action potentials, and communication between cells and groups of cells, are still imperfect. We want to develop a new way of recording neuronal activity, basing on the measurement of changes in the refractive index of the cell membrane. The project is funded by the Polish Ministry of Science and Higher Education and is a part of PhD thesis.

4.3. Projects Granted by National Centre for Research and Development

[Pro11] **Dual-mode blocks of the integrated circuit GALILEO and GPS signal receiver in nanometer CMOS technology for precise positioning of mobile objects** (Bloki dwusystemowego, scalonego odbiornika sygnałów nawigacji satelitarnej GALILEO i GPS w technologii nanometrowej CMOS do dokładnego pozycjonowania obiektów przenośnych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Witold Pleskacz, co-workers: Tomasz Borejko, Andrzej Berent, Jacek Grądzki, Aleksander Koter, Wiesław Kuźmicz, Arkadiusz Łuczyk, Krzysztof Marcinek, Krzysztof Siwiec, March 2011–September 2014

The aim of the project is to design and manufacture IC prototypes of the component blocks of an independent dual receiver for the European satellite navigation system called Galileo as well as for the American GPS-Navstar. The additional goals are to run and characterize a complex electronic system built with above blocks. The designed system will receive navigation data from both satellite systems simultaneously. This will significantly improve the accuracy of positioning and will be invaluable in urban areas where skyscrapers often block the satellite signal from one system. The existence of a second system will be crucial to determine the position and user will not need to worry about which system is currently used.

Positive results of developed solution in industrial environment will begin the process of full silicon integration as a SoC (System on Chip). Practical importance of the project results to industry and the possibility of using the results of the project by other entities will be unquestionable. These include high-tech companies (e.g. microelectronics) and commercial institutions, which are producing and integrating satellite navigation systems in various areas of civil applications where satellite navigation is very quickly gaining new followers and new uses. Designed two-mode receiver (Galileo-GPS) will provide greater accuracy and reliability of measurements compared with single-system receivers (GPS only). This will form the basis for next generation services and applications based on satellite data, which will benefit users from the industry, scientific institutions, public administration as well as individual customers.

[Pro12] I**nnovative graphen-titanium engine valve with improved functional properties** (Innowacyjne grafenowo-tytanowe zawory silnikowe o podwyższonych właściwościach użytkowych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jan Szmidt, April 2013–February 2016

The subject matter of the project covering development, based on a comprehensive interdisciplinary research, of a new material in the form of lightweight titanium alloys coated with graphene, with improved mechanical, physical and chemical properties for potential applications in the automotive industry will be an important contribution to research in the field of surface engineering and environmental protection. Developing a comprehensive characterization of performed graphene coatings, graphene/titanium alloy systems will form the basis for the phenomenological description of the phenomena occurring at the influence of certain loads. The performance tests of the finished product, in the form of graphene-titanium engine valves shall allow to estimate the changes that have occurred in the structure of Ti alloy and graphene coating, as a result of service loads of the developed final product. Thanks to this it will be possible to estimate the extent to which the graphene coatings covering the surface of the engine valves affect their functional parameters. As a result of the project implementation the primary utilitarian effect of the project will be the production of graphene-titanium engine valves, retaining stability even under extreme operating conditions, the experimental determination of their properties and analytical-numerical models of the valve behavior.

[Pro13] **Integrated circuit technology for measurement of psychophysiological parameters under dynamic conditions** (Mikroukładowa technologia pomiaru parametrów psychofizjologicznych w warunkach dynamicznych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Witold Pleskacz, co-workers: Tomasz Borejko, Jakub Kopański, Krzysztof Marcinek, Paweł Narczyk, Maciej Plasota, Tomasz Radomski, Krzysztof Siwiec, Andrzej Wielgus, October 2012–April 2016

The project aims to develop a new integrated circuit technology enabling the measurement of psychophysiological parameters under dynamic conditions. It will allow integration of multiple systems and measuring circuits inside the IC chip. Solution developed in the design will reduce the dimensions of the current applied solutions, increase reliability, lower power consumption and increase the possibility of applications.

New integrated circuit technology for measurement of psychophysiological parameters will be implemented through two parallel developed original solutions: bioSoC and bioSiP. BioSoC is a specialized integrated circuit, with the analog-digital signal processing paths and microcontroller for processing and analyzing data. BioSiP is a minimodule developed for integrating functions and measurement capabilities of modern diagnostic equipment. The developed measurement system will be attractive as a new generation of mobile devices, component monitoring systems and health care.

The project will result in measurement modules made on basis of the bioSiP and the bioSoC technology. Modules will be a part of drivers monitoring stand.

During realization of bioSoC modules, projects of following blocks will be developed: ECG measurement chain, EMG measurement chain, resuscitation rate measurement chain, sigma-delta A/C converter, power management block, I/O interfaces, microcontroller and RTC clock. Blocks will be integrated in a silicon die, which will be fabricated and packaged in plastic or ceramic package.

During realization of bioSiP modules, projects of chosen sets of bioSiP modules and complete research stand will be developed. The stand will be used to perform necessary tests of developed modules, including experimental tests of drivers. Software controlling bioSiP modules and research stand controlling system will be created.

[Pro14] I**ntegretaion of thermoeletrically cooled infrared photodetectors with wideband electonics** (Integracja detektorów podczerwieni chłodzonych termoelektrycznie lub pracujących w temperaturze otoczenia z szerokopasmowym układem odbiorczym), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Ryszard Kisiel, October 2013–November 2015

The project is aimed at development of a technology for integration of middle and long wavelength photodetectors with wideband electronics in miniature packages and creating a series of high-performance detection modules for a wide range of applications in modern optoelectronic systems. For building such modules, new detector chips will be designed and realized, and appropriate packages for them as well as IC amplifiers selected. Designing the modules will be based on electrical measurements of the detector chips, amplifiers and their interconnects, and aided with electromagnetic and circuit simulations. Several types of optimized detection modules will be realised and characterized to demonstrate maturity of the newly developed technology to the industrial implementation and the advance in the functionality and reliability performances of the modules achieved in comparison to existing counterparts.

[Pro15] **Light sources with cold emitters** (Źródła światła z zimnymi emiterami), Tele & Radio Research Institute, Institute of Physics of The Polish Academy of Sciences, Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jan Szmidt, co-worker: Piotr Firek, Jerzy Kalenik, November 2012–October 2015

The practical goal of the project is to elaborate a repetitive, stable in emission and highly efficient source of light with field emitter prepared from nannocomposite carbonaceous-nickel film (C-Ni). Our previous studies (performed during realization of MNT ERA NET project) enabled for an elaboration of technology for preparation of highly efficient field emission C-Ni films. These films are obtained by PVD and by PVD/CVD methods. In this project we will examine reasons and mechanisms of phenomena harmful for efficiency and stability of field emission from the films working in model system that is very closed to proposed for light source production. For achieve this goal there will be performed following groups of tasks:

1) studies of stability and durability of emitters prepared of nanocomposite C-Ni films;
2) characterization by TEM and SEM of C-Ni film before and after application in a cathode;
3) elaboration of energy-efficient and stable supplying system.

[Pro16] **Logistics and monitoring technologies and ways to protect the environment before starting work, during drilling, hydraulic fracturing processes and during the operation, including monitoring of groundwater, air, noise, soil, greenhouse gases and other** (Logistyka i technologie monitoringu oraz sposoby ochrony środowiska przed rozpoczęciem prac, w trakcie wiercenia, w procesach szczelinowania hydraulicznego oraz na etapie eksploatacji, w tym monitoring wód podziemnych, powietrza, hałasu, gleby, emisji gazów i innych), Warsaw University of Technology, project leader: Jarosław Arabas, **Task 3: Multiparametric sensor of liquid surface monitoring as possible methane source** (Analiza czujników metanu w kierunku aplikacji do monitorowania powierzchni zbiornika cieczy), sub-project leader: Michał Borecki, October 2013–September 2016

The objective of the project is the construction of low cost sensor that can continuously monitor surface of the flowback water pit as a methane source. For this purpose we plan to implement two innovations. The first task is to study the multiparametric methane sensor that consist of modified NDIR and SnO_2 heads equipped with additional aerosol, humidity and temperature sensing units. The second task is to study the integration technology multiparametric sensor in supernatant construction which is connected with development of local data processing methods.

[Pro17] **Methods and means of protection and defense against high power microwave pulses** (Metody i sposoby ochrony i obrony przed impulsami HPM), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Mariusz Sochacki, co-workers: Jan Szmidt, Piotr Firek, December 2014–December 2020

The protection and defense system against high power microwave pulses will be equipped with a limiting diodes. The protection semiconductor devices will be designed, manufactured and characterized in the Institute of Microelectronics and Optoelectronics. Wide bandgap semiconductors can be used in such kind of application, primarily the silicon carbide (SiC) wafers. The diodes will be characterized by means of current-voltage and capacitance-voltage measurements. Finally, the microwave properties of the devices will be studied, which is important especially in the context of their application in microwave transceiver circuits.

[Pro18] **Optical fiber sensors with nanofilms for examination of bioliquids** (Nanowarstwowe czujniki światłowodowe do biodiagnostyki cieczy), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Mateusz Śmietana, October 2011–September 2014

The aim of this project is to develop a technology, fabricate and conduct a complex characterization of modern optical fiber sensing structures nanocoated with overlays, which make them possible long-term monitoring of variations in properties of the liquids or state of the sensors' surface. In order to achieve this aim, depending on the foreseen application of the sensors, we will employ various vapor based deposition methods allowing for deposition of a wide range of films, followed by their plasma based processing. There is foreseen two main fields of applications, i.e., liquids containing components of biological origins forming biofilms on the sensor's surface (e.g. antigens, proteins, DNA, enzymes or bacteria) and oily liquids technologically modified (thermally or chemically). It must be noticed, that these liquids differ much, not only from a point of view of their origins, but first of all from the point of view of their physical and chemical properties. That fact forces application of different technology used for deposition and surface processing of the films for each of the applications.

[Pro19] **Soldier psychological profile management system including development and use of HEALTH-CHIPS technology** (System zarządzania profilami psychologicznymi żołnierzy z opracowaniem i wykorzystaniem technologii HEALTH-CHIPS), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Witold Pleskacz, co-workers: Andrzej Berent, Tomasz Borejko, Igor Butryn, Mariusz Derlecki, Patryk Kłoczko, Jakub Kopański, Krzysztof Marcinek, Maciej Moskała, Paweł Narczyk, Daniel Pietroń, Maciej Plasota, Tomasz Radomski, Krzysztof Siwiec, Paweł Wiecha, Łukasz Wiechowski, Andrzej Wielgus, May 2013–May 2016

The main goal of the project is to elaborate psychological profiles management system. In technological aspect, the project aims to develop unique in the world wearable integrated circuit, which will allow continuous monitoring and immediate analysis of physiological parameters of human body (including heart activity, respiration rate, oxygen saturation of blood, skin resistance, skin temperature and air pressure). "Health-Chips" (HeC) technology will be a part of experimental research leading to development of universal profiles of soldiers, taking into account their psychophysiological characteristics and level of training. HeC technology will consist of a few functional elements: dedicated integrated circuit BioChip (BCp), logical structure of psychological profiles and intelligent analytical software implemented in BCp, psychological profiles management system.

Realization of the main goal requires development of new technology in the area of sensors, data acquisition and processing techniques, proper modeling and inference to find soldier psychological profile.

[Pro20] **Supporting Educational Initiatives of the Warsaw University of Technology in Teaching and Skill Improvement Training in the Area of Teleinformatics** (Wsparcie inicjatyw Politechniki Warszawskiej w kształceniu i doskonaleniu w zakresie innowacyjnych technik teleinformatycznych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics in cooperation with University of Luxembourg, University of Nantes, and University of Copenhagen, sponsored by UE within Human Capital Operational Programme, POKL.04.01.01-00-086/13, project leader: Sławomir Słominski, task leader: Elżbieta Piwowarska, Marchr 2014–June 2015

The project is aimed at undertaking and developing innovative initiatives, methodologies and tools for supporting teaching and skill improvement training of students, academic staff, and professionals in the area of telecommunications, computer engineering, digital security, business analytics and R&D project management. The common thread going across all the tasks is e-learning, distance learning and hands-on exercises. Among others the following activities will be carried out: (i) postgraduate courses in the fields of telecommunications, cyber security, big data and business analytics; (ii) "Do It Yourself" workshops and hackathons (Arduino, Raspberry, 3D printers, actuators); (iii) a summer school in the field of micro- & optoelectronics and terahertz technologies; (iv) fellowships and study tours.

[Pro21] **Ultrafast Photodetector based on Graphene (PhotoGraph)** (Ultraszybkie fotodetektory grafenowe), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Paweł Szczepański, March 2013––December 2015

Graphene has shown to possess physical properties that make it suitable for light detecting with unique characteristics. The main objective of this project is to take advantage of these properties for developing graphene-based infrared photodetectors (GPDs) characterized by exceptional features. The main goal is to obtain very high speed, exceeding that available in uncooled devices based on narrow gap semiconductors.

We propose the GPD that will work in the middle and long wavelength (from 3 to 14 μm) infrared range. The device will operate at ambient temperature or at temperatures 300 to 180 K, achievable with low cost Peltier coolers. Importantly, the GPD will be characterized by usable signal to noise ratio level and response speed much faster compared to the existing IR devices operating at the same spectral range and temperature range.

We expect to achieve useful performance with careful design of active element and use of various solutions previously used in the LWIR IR photodetectors operating at near room temperatures. By doing so, we expect that the grapheme based infrared devices will be a subject of practical implementation and commercial fabrication for advanced optoelectronic applications.

[Pro22] **VESTIC: a new manufacturing technology for integrated circuits** (VESTIC: nowy sposób wytwarzania układów scalonych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Wiesław Kuźmicz, December 2012–November 2015

The topic of the project is VESTIC – a new manufacturing technology for silicon-based monolithic integrated circuits. The goal of the project is to develop a version of it mature enough for industrial applications. The advantages of VESTIC are: highly regular structure of circuits built of 3D active components, a new transistor named VeSFET, which is an ideal

active device for ultra-low power circuits, simple shapes on lithographic masks making nanometer-size components easier to manufacture. The VESTIC-based circuits can be manufactured using the same processes and materials that are used in standard CMOS technology; however, the sequence of operations is different. It is expected that the VESTIC-based circuits will be less expensive and the NRE costs of new designs will also be significantly lower. The expected results of the project are: manufacturing process suitable for a pilot fab line for ASICs and demonstrators: digital and analog circuits.

4.4. Projects Granted by the National Science Centre

[Pro23] **Development of an accurate model of traps in metal/insulator/4H-SiC structures by Thermally Stimulated Current (TSC) measurement** (Konstrukcja precyzyjnego modelu pułapek w strukturach metal/dielektryk/4H-SiC przy wykorzystaniu pomiaru prądu wzbudzanego termicznie (TSC)), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jan Szmidt, April 2013 – February 2016

The aim of the research is the use of the method of characterization using the temperature change of the sample to determine the energy structure of electrically active traps in SiO_2/SiC interface and cross-section of the trap, resulting in a realistic possibility of linking the results of electrical measurements of the traps with the reasons for their formation. A new setup will be designed and implemented to measure Thermally Stimulated Current (TSC) of MIS test capacitors. It was hypothesized that the application of room temperature techniques without the use of light in the spectrum strongly connected with the absorption edge of the semiconductor material, such as the commonly used Terman method based on the measurement of high-frequency capacitance-voltage characteristics (HF C-V) gives too low energy resolution of traps position in the bandgap, and the sensitivity of the method at room temperature is often too small for the characterization of samples with the best performance (low density of traps).

[Pro24] **Electrical characterization of the advanced MIS structures in the range of low and very low frequencies** (Elektryczna charakteryzacja zaawansowanych struktur MIS w zakresie niskich i bardzo niskich częstotliwości), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jakub Jasiński, July 2013–January 2016

Search for new dielectric layers is one of the important development trends of contemporary microelectronics. These layers are applied in almost all types of modern semiconductor devices (gate dielectrics of MIS capacitors and transistors, non-volatile memory cells). Simultaneously the development of microelectronic industry is always accompanied by scaling. Reduction of device dimensions leads to the intensification of carrier tunneling through ever thinner dielectric layers.

In the case of ncMOS structures tunneling a is a process which leads to charge/discharge nanocrystallites, while in multi-layer high-k dielectrics with a thin buffer layer the tunneling current may charge/discharge traps located at the interface between dielectric layers and built-in high-k layer.

The nature of the charge/discharge processes mentioned above and the accompanying mechanisms of carrier transport in the ultra-thin dielectric layers seems to be revealed in the range of low and very low frequencies, due to the fact that time constants of these processes can be high in certain situations. The Authors of this application, however, did not find the results of such characterization of mentioned structures in the literature. The characterization presented in the literature is usually limited to static I(V) characteristics or C(V) and G(V) curves at frequencies equal or higher than 500 Hz.

Deeper understanding of the phenomena accompanying the current flow through the dielectric layers mentioned above may require characterization in a wider frequency range, beginning from a few hundredths Hz. This will enable development of a more comprehensive small-signal model of the investigated layers than that presented in the literature. The model will most probably contain elements denoting phenomena that may only be observed at low-frequency measurements. This will also enable extraction of electrophysical parameters of the structure that could not be extracted so far.

[Pro25] **Highly sensitive ISFET matrix transistors with functional dielectrics on new generation** (Wysokoczułe matryce tranzystorowych struktur typu ISFET z funkcjonalnymi dielektrykami nowej generacji), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Piotr Firek, co-workers: Jan Szmidt, Mateusz Śmietana, Mariusz Sochacki, Aleksander Werbowy, Ryszard Kisiel, Michał Borecki, Robert Mroczyński, Ryszard Jachowicz, Jerzy Weremczuk, Daniel Paczesny, Grzegorz Tarapata, Krzysztof Zdunek, Katarzyna Nowakowska-Langier, April 2011–April 2014

The aim of the project is to elaborate the technology of Ion Sensitive Field Efect Transistor – ISFET) with the gate dielectric layers made of various materials that determine sensitivity of every element of the matrix. There are used common dielectric layers such as: SiO_2, SiOxNy, but also these with the specific properties: $BaTiO_3$, HfO_2 which are characterized by the high value of relative dielectric, DLC (Diamond-Like Carbon) that are biocompatible, and the new generation dielectrics with the highly promising properties, such as Al_2O_3 i AlN.

[Pro26] **Microstructure Analysis of Electroluminescent Zinc Sulphide Phosphors for Application in Printed Electronic Devices** (Analiza zjawisk degradacji starzeniowej siarczku cynku, na potrzeby nowej generacji elastycznych elektroluminoforów), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Mateusz Mroczkowski, February 2014–February 2015

The objective of the research project was to perform the analysis of zinc sulphide phosphors, in order to determine changes that take place during phosphors' degradation. It was also of interest to find how such changes in microstructure relate to the changes of parameters of phosphors, such as luminance.

In the first phase of the project, a series of test thick-film alternating-current electroluminescent (ACEL) lamps were fabricated. In the second part of the research, test samples were degraded by applying an alternating electric field that had frequency from 100 Hz to 20 kHz. Next, microscopic studies (TEM, SEM, EDS) of degraded samples were performed.

No changes of microstructure of copper-dopped ZnS phosphors were observed.

[Pro27] **New processes and technology for assembly and hermetic SiC high temperature packages** (Nowoczesne procesy i technologie na potrzeby montażu i hermetyzacji elektroniki wysokotemperaturowej na bazie SiC), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Ryszard Kisiel, co-workers: Marek Guziewicz, Włodzimierz Strupiński, Zbigniew Szczepański, Mariusz Sochacki, Jan Szmidt, Piotr Firek, Małgorzata Kalisz, Teodor Paweł Gotszalk, Jarosław Kraśniewski, Aneta Olga Hakpa, Aleksander Werbowy, Maciej Oleksy, April 2011–April 2014

The aim of the project is to elaborate prototype packages for SiC high temperature devices able to continuous work at 350 °C and short term work at temperature of 500°C. To fulfill these requirements it is necessary to elaborate assembly technology of SiC devices to ceramic substrate as well as electrical package interconnectors that are able to work in such high temperatures.

[Pro28] **Novel luminescent materials for mid-infrared region – analysis and investigation of optical properties of chalcogenide glasses doped with rare earth ions** (PRELUDIUM Nowe materiały luminescencyjne na zakres średniej podczerwieni – badanie i analiza właściwości optycznych szkieł chalkogenidkowych domieszkowanych jonami ziem rzadkich), project leader: Krzysztof Anders, February 2014–February 2017

The aim of the project is to investigate and comprehensively analyse the mid-infrared radiation conditions of chalcogenide glasses doped with rare earth ions. The set of studied materials consists of experimental series of bulk samples of low phonon chalcogenide glasses (based on GeAsGaSe compounds) doped with praseodymium, dysprosium, terbium and holmium. The framework of the project is research and analysis of the spectroscopic properties (absorption, excitation and emission characteristics; fluorescence dynamics, including the measurements in the cryogenic temperatures ~7K) that will allow analysis of excitation and relaxation mechanisms of electron states responsible for the emission in the mid-infrared region – MIR (> 3 um). Until now, this spectral range, particularly attractive for application in metrology, sensing, medical, and military, has been practically out of reach of typical, compact laser sources (semiconductor lasers and solid state lasers).

[Pro29] **Optical gyroscope in an experimental photonic integration technology – analysis of possibility of realization and research on basic properties** (Żyroskop optyczny w eksperymentalnej technologii fotoniki scalonej – analiza możliwości wykonania i badania podstawowych właściwości), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Stanisław Stopiński February 2014–February 2016

The main project objective is research and analysis of possibility of realizing a monolithically integrated optical gyroscope in an experimental, indium phosphide based photonic integration technology. Tackling of this problem is mainly inspired by the recent advances in the field of fabrication technology of integrated optoelectronic devices, combined with pure scientific curiosity. However, in a longer perspective proving the proposed hypothesis can pave the way for launching projects oriented towards applied research, potentially interesting for the Polish navigation systems industry. The scientific challenge is very attractive – to the author's best knowledge there are no examples of realization of a fully integrated optical gyroscope, despite a large research effort in this field.

[Pro30] **Oxide nanostructures for electronics, optoelectronics and photovoltaics** (Nanostruktury tlenkowe do zastosowań w elektronice, optoelektronice i fotowoltaice), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jan Szmidt, June 2013 – June 2018

The aim of this project is an explanation and description of complex electro-optical properties of a group of wide band gap oxide materials (Al_2O_3, HfO_2, ZrO_2, ZnO). Despite the fact that these materials are presently key elements of modern electronic (gate oxides, transparent electronics, memories), optoelectronic (transparent contacts) and photovoltaic (transparent contacts) devices, influence of growth conditions on their electrical and optical properties is still not clear. By selecting growth conditions we can deposit both dielectric (isolating) and semiconducting layers, in the case of ZnO even with a metallic conductivity. Doped in a controlled way, grown at specific conditions, thin layers of ZnO should enable us construction of transparent contacts to wide band gap semiconductors (SiC, GaN). To achieve the goals of the project we should answer several questions on the origin of shallow donors in ZnO, in particular the role of hydrogen in these films (our present investigations question the fact that hydrogen is dominant shallow donor in our films), on the role played by vacancies in conductive and dielectric films, on the method of recrystallization blocking of gate oxides, on the mechanisms of compensations in ZnO layers grown in the ALD processes with ammonia water. We will investigate why gate oxides (mainly HfO_2) have excellent isolating properties, when deposited as amorphous ones, but loose these properties after recrystallization. Thus, the ways to block their recrystallizations are crucial and need detail investigations. The working hypothesis is that small deviations from oxides stoichiometry importantly affect electro-physical material parameters of selected oxides.

[Pro31] **Study on possibilities of shaping the luminescent properties of composite white light sources based on polymer materials** (PRELUDIUM Analiza możliwości kształtowania właściwości luminescencyjnych kompozytowych źródeł światła białego na bazie materiałów polimerowych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Anna Jusza, February 2014–February 2017

The aim of this project is an investigation and analysis of the shaping possibilities of visible (red, green and blue) luminescence properties of the new class of optically active materials – composites based on polymer matrices doped with nanocrystals activated by praseodymium ions. Investigated materials oxide, fluoride and oxyfluoride nanocrytallites of varying crystalline structure doped with different concentration of Pr^{3+} as well as bulk polymer composites based on PMMA (poly[methyl methacrylate]) doped with these nanocrystals. Selection of the praseodymium as the activator is mainly due to the favorable energy levels scheme allows for obtaining emission in red, green and blue spectral range and thus white light with a color temperature dependent on the ratio between the intensities of individual optical transitions. High sensitivity of praseodymium optical properties on crystalline surroundings parameters is an additional advantage, should provide the ability of manipulating of the individual emission lines intensities.

The main outcome of this project will be the extension of the state of the art on the influence of crystalline surroundings (crystalline phase, net position, surface states, maximum phonon energy) and structural properties (specific surface area, average particle size, agglomeration level) on the luminescent properties of praseodymium doped nanocrystals as well as polymer-based composites activated with these nanopowders.

[Pro32] Technology and characterization of ultrathin silicon layers formed by means of PECVD for nanelectronic applications (Technologia i charakteryzacja ultracienkich warstw krzemu wytwarzanych metodą PECVD na potrzeby struktur nanoelektronicznych), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Romuald B.Beck, August 2012–August 2015

The main aim of this project is to screen experimentally the possibility of using PECVD as a method of formation of ultrathin silicon layers in nanodevices basing on double barrier structure (i.e. with ultrathin layers stack: insulator-silicon-insulator).

Within this project we plan optimization of Si PECVD in order to achieve full control of growth of the Si layer in ultrathin range, while preserving possibly best properties of this layer at the same time. We will also investigate dependencies between processes used (and their parameters) and electrophysical properties which are critical for application of the studied technologies to manufacturing the nanodevices basing on such a stack (tunneling and resonant tunneling, Coulomb blockade, or 3D quantum dots). Special attention will also be paid to analysis of influence of high temperature processing, namely thermal annealing and/or oxidation, which may be used for improving the quality of the layers and their interfaces, but also – for obtaining 3D quantum dots embedded in dielectric layer.

Fabricated, within the scope of this project structures will be studied mainly be means of electrical characterization methods of purposely designed test structures. Careful analysis of voltage-current and capacitance-voltage characteristics, measured under within wide range of temperatures and frequencies, using appropriate theoretical models, we will derive information among others on: mechanisms of charge carriers transport, their mobility, density and localization (in space and energy) of traps and other uncompensated charges, resistivity to voltage stresses and breakdown effects.

Particular attention will be paid to screening on the measured electrical characteristics the effects related with resonant tunneling, Coulomb blockade, presence of quantum dots and charging/discharging of traps (which can be applied for nano-flash memories).

Other methods (mainly: spectroscopic ellipsometry, HRTEM, SIMS and XPS) will be used to analyze composition and structure of the Si layers in order to correlate changes of these properties (e.g. resulting from medium- and high – temperature processing) with electrical behavior of characterized test structures.

Hence, accumulation of knowledge on the possible fields of application of PECVD ultrathin silicon layers to manufacturing of nanoelectronic devices will become inevitable result of this project.

On the other hand, the scale of possible variability of electrophysical properties of these layers themselves, as well as of structures based on them will allow for more realistic modeling and simulation of novel nanodevices electrical behavior, thus allowing quicker progress in theoretical works and design of such devices.

As a result, knowledge and skills acquired within the scope of this project may shorten significantly the time between demonstrators and commercial production of silicon based nanoelectronic structures. Thus, the results achieved during this project will be of great interest not only for scientific community, but also, in longer term, by industry.

[Pro33] The conditions of short-wavelength emission excitation in optically active low-phonon glasses and composite materials pumped with pressure-tuned laser diodes (Warunki wzbudzania emisji krótkofalowej w aktywnych optycznie szkłach niskofonowych i materiałach kompozytowych pompowanych przestrajalnymi ciśnieniowo diodami laserowymi), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Ryszard Piramidowicz, August 2012–February 2015

Short-wavelength radiation, typically understood as near-UV, violet up to blue-green, is important to many aspects of life, society, and technology. As such it has been addressed often in science and technology in the past several decades. Noncoherent short-wavelength radiation, starting at about 100 nm is present in sunlight, although due to absorption in upper atmosphere, very little reaches Earth's surface. The so-called black lights, or Wood light (filtered broadband radiation of e.g. $SrB_4O_7:Eu^{2+}$) and mercury vapour fluorescent UV lamps are typically used for germicidal purposes. Gas-discharge lamps and flash lamps emitting incoherent, broadband radiation due to arc discharge in noble gas plasma, are used e.g. in special lighting, pumping of solid state lasers (including laser at the National Ignition Facility in the USA) or for stimulating or characterizing various biological processes. Better efficiency, longer lifetimes, faster on-off times, dimming

capability, less heat generation, together with comparatively lower price, make wide band gap semiconductor light emitting diodes (LEDs) take over from lamp sources, specifically in areas like lighting (and exciting filtering phosphors), bio-imaging or biostimulating processes in medicine and life sciences.

The scientific goal of the project is investigation and versatile analysis of main physical mechanisms of shortwavelength emission and lasing in novel optical materials activated with selected rare-earth ions excited by unique infrared, pressure-tuned laser diodes. Initial research enables formulation of the main hypothesis that careful choice of excitation combined with matrix properties and dopant concentration optimizations, allows controlling character and dynamics of upconversion processes, enabling to precisely tailor luminescent properties of the investigated materials. This applies specifically to vitroceramic composites and, being the most promising direction, polymers activated with rare earth nanocrystallites. As the final result we expect significant broadening and systematization of knowledge on up-conversion mechanisms (and specifically various types of energy transfers) shaping short-wavelength luminescent properties under IR excitation in low phonon glasses and composite materials. Wide lineup of investigated hosts and concentrations along with novel experimental approach based on unique, pressure-tuned diode laser excitation, is to yield new knowledge that would disturb technologies of photonic materials and devices.

[Pro34] **The effect of phosphorus on the electro-physical properties of dielectric layers produced by 4H-SiC thermal oxidation** (Wpływ fosforu na właściwości elektro-fizyczne warstw dielektryków wytwarzanych metodą termicznego 4H-Sic), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Krystian Król, March 2013–March 2016

The goal of the project is conducting research on possibility of influencing electrical parameters of metal-oxide-semiconductor structure on silicon carbide (SiC) by introducing additional elements to interface region of this structure. The main hypothesis of planed research is that electrical properties of thermal oxides obtained on silicon carbide can be improved (especially by decreasing interface density of states Dit) by introducing phosphorus to transition region of MOS structure using shallow ion implantation. This technology can be beneficial for understanding oxidation process of silicon carbide. By performing chemical, and electrical research of prepared samples an effect of phosphorus incorporation will be described. As a result an explanation of mechanisms responsible for observed phenomenon will be proposed. A secondary goal of this project is developing optimal technological steps with respect to electrical properties of MOS structure using thermal dielectric on SiC with special consideration of interface density of states.

[Pro35] **The influence of subsurface doping of silicon carbide (4H-SiC) by ion implantation on electrophysical properties of MOS structures fabricated by thermal oxidation** (Wpływ przypowierzchniowego domieszkowania węglika krzemu 4H-SiC techniką implantacji jonów na właściwości elekrofizyczne struktur MOS otrzymywanych w wyniku utleniania termicznego), Warsaw University of Technology, Institute of Microelectronics and Optoelectronics, project leader: Jan Szmidt, co-workers: Jerzy Żuk, Jacek Szuber, Bogusława Adamowicz, Mariusz Sochacki, Włodzimierz Strupiński, Małgorzata Kalisz, Piotr Firek, Aleksander Werbowy, Alina Domanowska, Piotr Kościelniak, Norbert Kwietniewski, Krystian Król, April 2011–April 2014

The main objective of the project is primarily to understand the processes taking place in the SiO_2/SiC interface in the presence of nitrogen and an explanation of the reasons of the lower density of surface states including gate dielectric technology development towards commercialization of MOSFET transistors. The role of carbon in surface states creation and the role of nitrogen in reduction of the surface states density including the nature of chemical bonds in the interface will be investigated by profiling X-ray Photoelectron Spectroscopy (XPS) and profiling Auger Electron Microscopy (SAM). The second stream of research is an extraction of electrical parameters of MOS structures and the determination of the relationship between electrical parameters and the fabrication technology. The parameters of thermal oxidation will be proposed to implement the process into simulation software. The electrical simulation will take into account the technology details if the correlation is obtained through the experimental work.

4.5. Projects Granted by International Institutions

[Pro36] **PARADIGM Photonic advanced research and development for integrated generic manufacturing** (Zaawansowane badania nad rozwojem generycznych technologii fotonicznych układów scalonych), EU structural project, project leader: Paweł Szczepański, co-worker: Katarzyna Ławniczuk, September 2011–September 2014

The aim of the PARADIGM project is to create a paradigm shift in the development and manufacturing of photonic integrated components and circuits based on Indium Phosphide. This shift will result in the cost and time reduction of design, development, manufacturing and packaging based on generic foundry concept. The generic concept, as it is in micro-electronics and CMOS technology, enables realization of multi-functional circuits using only a set of standard building blocks. By introducing the generic concept to photonics field, realization of application specific photonic integrated circuits (APSICs) would be possible within standardized technological processes, and as a result functionally advanced photonic circuits would be introduced to our daily usage, daily life.

Institute of Microelectronics and Optoelectronics, Warsaw University of Technology, as its aim within the project, proposed establishing an Eastern Europe Design Hub (EEDH). EEDH will offer the state-of-the-art expertise in design, development and characterization of ASPICs to companies and research institution form Eastern part of Europe. By having an access to the advanced photonic technologies, establishing a laboratory of photonic component's and circuit's characterization, providing access to the most up-to-date software and simulators, EEDH will become a strategic partner in photonics in Eastern Europe part. Additionally EEDH creates an awareness of generic concept and ASPICs within Eastern Europe mainly by disseminating the knowledge of the potential of integrated photonics, its applications and generic fabrication model.

More information about the PARADIGM project is available on the website: www.paradigm.jeppix.eu.

[Pro37] **Technology of new generation of hydrogen and hydrogen compounds sensor for over normative conditions applications "DETEH"**, (Opracowanie technologii nowej generacji czujnika wodoru i jego związków do zastosowań w warunkach ponadnormatywnych), EU structural project, project leader: Jan Szmidt, co-workers: Jerzy Kalenik, Piotr Firek, Aleksander Werbowy, Mateusz Śmietana, July 2009–June 2014

The main purpose of the project is the study on technology of new generation sensor of hydrogen and his compounds for over normative conditions applications e.g. high temperature, high pressure or aggressive environment. The research aims of the project are connected with carbon nanomaterials technology with Pd nanograins (in sensor active area) and investigations of connection between structure of sensor active layers and their reaction on hydrogen, hydrogen compounds presence.

[Pro38] **THIN but Great Silicon 2 Design Objects (Układy scalone CMOS w technologii ultra-cienkiego krzemu** (THIN but Great Silicon 2 Design Objects)), EU project, ENIAC, project leader: Wiesław Kuźmicz, co-workers: Elzbieta Piwowarska, Zbigniew Jaworski, September 2014–December 2017

THINGS2DO is focused on building the Design & Development Ecosystem for FD-SOI-technology. This technology is uniquely positioned to take advantage of some very distinct strengths of the European Semiconductor Industry.
The design/development ecosystem is based on 3 pillars:

- EDA – design automation is the basis to perform complex design creation and porting tasks;
- IP – availability of pre-designed building blocks is an absolute must for any emerging technology;
- Services – are a combination of IP and EDA-tooling. There is a rich mix of SMEs in Europe focused on this topic, providing service offerings to bring the innovative potential of FD-SOI.

4.6. Other Projects

[Pro39] **Composite polymer fibers doped with RE^{3+} ions – new generation of active media for visible light sources** (Kompozytowe światłowody polimerowe domieszkowane jonami RE^{3+} – nowa generacja ośrodków aktywnych do zastosowań światła na zakres widzialny), project funded by Innovative Economy Programme (POIG) and The Foundation for Polish Science (VENTURES/2012–10/3), project leader: Anna Jusza, February 2013–January 2014

The main aim of the project is the development of manufacturing technology and investigation of luminescent properties of a new optically active materials for visible light sources applications – composite fibers based on polymer matrices doped with RE^{3+} activated nanocrystals. Composite materials, which are a combination of two different phases with different optical and mechanical properties – for example, a polymer matrix with embedded active nanocrystallites, creating the potential for the design and construction of an entirely new class of light sources, characterized by small size, low price and excellent optical and mechanical properties. These materials can be widely applied in modern optical telecommunications systems (such as FTTH networks based on polymer fibers), integrated optoelectronics, optical information processing, and many others. In particular, the specific nature of the composite material allows to obtain an efficient emission (and possible generation) in short-wavelength range of optical spectrum in materials of excellent thermo-mechanical properties, such as PMMA, which is considered as inapplicable in such active systems up to now (because of the high values of phonon energies).

[Pro40] **Time for e-teachers. Modern knowledge and methodology in education** (Czas e-Nauczycieli. Nowoczesna wiedza i metodyka w dydaktyce), project sponsored by UE within Human Capital Operational Programme, granted by Mazovian Unit of EU Programmes Implementation, cooperation with the Institute of Informatics WUT, POKL.09.04.00-14-109/11, project leader: Elżbieta Piwowarska, July 2012–June 2014

The project was aimed at the teachers living or teaching in villigies of masovian district. During the project 12 courses on information technology and e-education methods and tools were prepaired and provided. Blended learning methods were applied for the courses.

5. DISSEMINATION OF KNOWLEDGE

5.1. Students Scientific Associations

5.1.1. Students Scientific Association of Microelectronic and Nanoelectronics (KNMiN) (Koło Naukowe Mikroelektroniki i Nanoelektroniki KNMiN)

Association Tutor: Mateusz Śmietana, Ph.D., D.Sc.
Members of the Board: Anna Katarzyna Dębowska, Dariusz Burnat, Bartosz Michalak, Konrad Sośnicki
Total number of Members: 64

In the interests of the Students Scientific Groupof Microelectronics and Nanoelectronics are issues mainly related to the technology, design instruments, characterization and application of new materials in the field of optoelectronicsand microelectronics. Examples of topicsdealt with by the members of the Student Scientific Associacion: preparation and characterization of semiconductor structures, the organization of trips to conferences, workshops and symposia (where group members can getacquainted with the latest achievements in the field of micro, nano and opto-electronics, meetings of eminent personalities from the world of modern science and to present the results of their own research).

Activities of KNMiN members in 2014:

Organization of scientific meetings

- "The construction of integrated biochemical sensors using photonic resonator with a whisperingmod", Andrzej Kaźmierczak, 20.03.2014
- "Internship inIMEC", Marcin Myśliwiec, Piotr Wiśniewski, 24.04.2014
- "Fiber Photonic with high nonlinearity – design, manufacture, selected applications", Mariusz Klimczak, 20.05.2014
- "Cezamat – the place where today technologies of tomorrow's are made", Piotr Firek, 06.11.2014
- Test report, Bartosz Michalak.
- Test report, Anna Katarzyna Dębowska, Dariusz Burnat.

Participation in conferences:

- Student Seminar Konopnica 24–26.10.2014. (prizes: 1st place in the category "Individual Presentation")
- The winners of the Diamond II Conference Grant, Łódź 21––23.11.2014
- 9th Integrated Optics – Sensors, Sensing Structures and Methods, IOS'2014, Szczyrk 03–07.03.2014

Exhibitions:

Participation in the implementation of the interactive exhibition "From a single crystal of Jan Czochralski to graphene", held on 15–23.03.2014 at the Faculty of Physics, PW (organizing ofstand, presenting various crystal obtained by Czochralski method and plates of semiconductor devices). The exhibition will visit 10 Polish cities.

Publications of KNMiN members in 2014 in journals:

1. Michalak B., Śmietana M. and Koba M., "Optical fiber refractometer based on silicon nitride nano-overlay deposited with PECVD method", 23rd International Conference on Opical Fibre Sensors, Proc. of SPIE, vol. 9157, (2014);
2. Krogulski K., Śmietana M., Michalak B., Dębowska A. K., "Effect of TiO_2 nano-overlays deposited with atomic layer deposition on refractive index sensitivity of long-period gratings", Proc. of the 8th International Conference on Sensing Technology, Liverpool, UK, (Sep. 2–4, 2014);
3. Kalisz M., Szymańska M., Dębowska A. K., Michalak B., Brzozowska E., Górska S., Śmietana M., "Influence of biofunctionalization process on properties of silicon oxynitride substrate layer", Surface and Interface Analysis, John Wiley & Sons, Ltd. (2014);
4. Krogulski K., Śmietana M., Michalak B., Dębowska A. K., Dudek M., Witkowski B. S., Mikulic P., Bock W. J., "Properties of diamond-like carbon nano-coating deposited with RF PECVD method on UV-induced long-period fibre gratings", Physica Status Solid A, 1-6 (2014);
5. Borysiewicz M. A., Myśliwiec M., Gołaszewska K., Jakieła R., Dynowska E., Kamińska E., Piotrowska A., Thermal stability of multilayer Ti_2AlN-based ohmic contacts to n-GaN in ambient air, Solid-State Electronics 94 (2014), str.15–19

5.1.2. Student Scientific Association of Optoelectronics (KNO) (Koło Naukowe Optoelektroniki KNO)

Association Tutor: Ryszard Piramidowicz, Ph.D, D.Sc.
Members of the Board: Anna Jusza, Krzysztof Anders
Total number of Members: 5

Student Association of Optoelectronics formally started in May 2006, however, the custom of nonobligatory student seminar meetings – foundation of our Association – has been successfully continued since 2002. Presently, the Association consists of students and Ph.D. students of Institute of Microelectronics and Optoelectronics, however graduate professionals complement our ranks, as well.

Main scientific interest:

- Fiber lasers and amplifiers
- Photonic Integrated Circuits
- Special optical fibers and fiber components
- New optically active materials for light sources (polymers, composites, glasses an nanocrystals doped with Rare Earth ions)

The goals of Student Optoelectronics Division:

- becoming more knowledgeable and research interests developing of Division's members,
- popularization of optoelectronics and photonics technology disciplines,
- conducting research and development work introducing Division's members to the character of scientific work,
- support of diverse forms of activity leading to the development of Division members' professional skills.

Activities of KNO members in 2014:

Participation in conferences:

- 15th Conference on Optical Fibers and Their Applications, 29.01–01.02.2014, Białystok – Lipowy Most, Poland
- Conference on INTEGRATED OPTICS – Sensors, Sensing Structures and Methods IOS'2014, 3–7.03.2014, Szczyrk, Poland
- SPIE Photonics Europe 14–17.04.2014, Brussels, Belgium
- XXXIV-th IEEE-SPIE Symposium Wilga 2014, 26.05.2014 – 01.06.2014, Wilga, Polska
- 17th International Conference on Luminescence and Optical Spectroscopy of Condensed Matter, ICL'2014, 13–18 July, Wrocław, Poland
- Participation in workshop: "Technological spin-off as a tool for research results commercialization", 10.06.2014, Instytut Badań Stosowanych PW, Warsaw
- Participation in Summer School: XVIth International Krutyn Summer School "Lanthanide-based photonic materials and structures: breakthrough applications and cutting edge systems", 31.08–6.09.2014, Krutyń
- Organization and participation in training: Characterization of Photonic Integrated Circuits, 8–12.12.2014, Warsaw
- Participation in scientific grants and projects leading by KNO members and IMiO stuff

Publications of KNO members in 2014 in journals:

1. Jusza A., K. Anders, Polis P., Stępień R., Lipińska L., Piramidowicz R., "Luminescent properties in the visible of Er^{3+}/Yb^{3+} activated composite materials", Optical Materials 36 1749–1753 (2014);
2. Stopiński S., Malinowski M., Piramidowicz R., Kazmierski C., Smit M.K., Leijtens X.J.M, „Photonic Integrated Multichannel WDM Modulators for Data Read-Out Units", Journal of Lightwave Technology 32(23) (2014) 3879–3887

5.1.3. Students Scientific Association of Microsystems (ONYKS) (Koło Naukowe Mikrosystemów ONYKS)

Association Tutor: Jakub Jasiński, M.Sc.
Members of the Board: Mateusz Kamiński, Piotr Błachnio, Grzegorz Bernat
Total number of Members: 20

The members of the Students Scientific Association are involved in the implementation of various projects (analog, microcontrollers, FPGAs) and have necessary tools to accomplish circuit boards. The scientifict interest also includes popularization of electronics among the youth and students.

Activities of KNO members in 2014:

In 2014 Students Scientific Association take part in the following events:

- XVIII Festival of Science organized by Polish Academmy of Sciences in Jabłonna Organized "Soldering school" – which enjoys enormous popularity (visitors soldered more than 100 sets).
- Warsaw Uniwersity of Technology Open Days 2014Students Scientific Association organized the workshop on techniques of soldering.

ONYKS has realized the following projects:

- Universal Prototyping Platform
  The project aimed to build a multi-tasking platform to automate as many tasks related to the implementation of finished prototypes electronical devices. Also we develop a computer model of the mechanical part and made prototype stepper motor driver.
- Construction Oscilloscope
  The aim of the project was to build a complete oscilloscope with logic analyzer. The device consists of: PCIe module from analog to digital and analog module with the track. The whole thing is designed so that the device can be connected to a regular PC with a PCI Express motherboard.
- Led Cube
  The main aim of the project was to test the SPI communication and verify the operation of the shift register. 27 leds are controled by STM32 microcontroller. Each LED can be addressed individually in software, enabling it to display amazing 3d animations.

5.2. Cooperation with schools

In 2014 the Institute of Microelectronics and Optoelectronics actively participated in various forms of the popularization of science and knowledge among high school students. The main objective of this activity was to present the fields of science and technology represented by our Institute and thus encourage young people to study them.

Within the Wszechnica projects our scientists gave several lectures (Jan Smidt, Piotr Firek – "Nanoworld – the reality and dreams", Ryszard Piramidowicz – "Laser – light with unusual properties," Robert Mroczyński – "How to make a chip"). Several demonstrations were organized in IMiO's advanced laboratories (Semiconductor Technology lab, Photonics lab, Photovoltaics lab, IC Design lab, Image Processing labThe Wszechnica project is managed by Slawomir Szostak.

IMiO participated in the 19th Science Festival delivering several lectures and organizing a stand to demonstrate various research fields with great help from the students belonging to Microsystems ONYKS, Microelectronics and Nanoelectronics, and Optoelectronics Research Groups

In 2014, IMiO signed a cooperation agreements with the Tadeusz Czacki XXVII High School in Warsaw and Heroes of Westerplatte School of Electronics in Radom.

5.3. Fiber-Optic Photonics Platform (FOPP)
Polska Platforma Fotoniki Światłowodowej (PPFŚ)

Coordinator:
Ryszard Piramidowicz, Ph.D, D.Sc.
Warsaw University of Technology, Institute of Microelectronics and Optoelectronics

Consortium members:
Warsaw University of Technology (PW)
Bialystok University of Technology (PB)
Institute of Electronic Materials Technology (ITME)
Marie Curie-Sklodowska University (UMSC)
West Pomeranian University of Technology (ZUT)

Timeline: 2014–2018

The fundamental research objective of the Platform is to develop novel, innovative solutions for broadly understood optical fibers photonics, including such focus areas as sources and amplifiers of coherent and incoherent radiation, passive and active optical fibers of specially designed optical properties, micro-and nano-structured (including PCF) fibers for special applications, optical fiber sensors, micro and nano-optical elements and components.

The Platform is based on five pillars:

1) modeling and design,
2) fabrication technology,
3) characterization,
4) development and prototyping,
5) validation and testing constituting the complete food-chain of the manufacturing process.

Technological competences, indispensible for such a project, are offered by three main players on the Polish market of the fiber-optic technology: the Institute of Electronic Materials Technology (ITME), the Bialystok Technical University (PB) and the Marie Curie-Sklodowska University (UMCS). The design, characterization and prototyping capabilities are disposed by the three research groups of the Warsaw University of Technology (PW), while the validation and testing issues are covered mainly by West Pomeranian University of Technology (ZUT) and Warsaw University of Technology (PW). The combined potential of the platform's partners enables undertaking of practically all kinds of research and development work within the area of fiber-optic photonics and also significant involvement in the research within the field of planar/strip waveguide-based integrated structures. The main fields of interest are a result of up-to-now conducted projects (both fundamental research and R&D works), present expertise of partners and continuously monitored and anticipated demands of the market.

The core of the consortium consists of photonics fiber laboratories situated at the Warsaw University of Technology supported by technological laboratories of the main Polish manufacturers of specialty optical fibers (ITME, UMCS, PB). Infrastructure is complemented by testbeds of photonic systems offered by PW and ZUT. It is worth pointing out that the consortium members already have a unique infrastructure at their disposal and have technological ability and technical skills for manufacturing the sophisticated fiber-optic elements, successfully competing on the global market with the products of the most significant commercial manufacturers. Good examples are microstructed silica and polymer fibers developed at UMCS and systematically purchased by leading European research institutes and companies and nano-structured graded index lenses and microscope objectives

5.4. Photovoltaic Platform, Warsaw University of Technology (PVP) Platforma Fotowoltaiki Politechniki Warszawskiej (PF)

Coordinator:
Ryszard Piramidowicz, Ph.D, D.Sc.
Warsaw University of Technology, Institute of Microelectronics and Optoelectronics

The Photovoltaic Platform was established in 2014 at Warsaw University of Technology in order to increase utilization of the scientific potential and encouraging industry-oriented research services. The Photovoltaic Platform aims to bring together complementary competences of various research groups throughout University creating strong multidisciplinary photovoltaic group capable of successful realization of both large research projects and development of complete solutions for the industry partners. The Photovoltaic Platform core consists of teams from the Faculty of Electronics and Information Technology and Faculty of Physics, as well as teams from other faculties involved in research on various aspects of photovoltaic technologies.

Range of competences of the gathered research groups covers all levels of photovoltaics – from physics of the solar cells, structure of modules, inverters and mounting large methods, design, development and performance evaluation of photovoltaic systems up to energy profiles prediction and assessment of grid integration issues. The teams also help prospective investors to evaluate their model of engagement in the photovoltaic market, taking into consideration technical challenges, legal environment and economic feasibility.

Cooperation with industry partners is critical for long term development of photovoltaics at the Warsaw University of Technology. The Photovoltaic Platform cooperates closely with a number of large utility companies interested in taking part in expected rapid photovoltaic market development. The platform prepared concept study and design of test photovoltaic system for utility company. It also conducts quality assessment of small photovoltaic systems prepared by local installer companies to ensure all systems installed under utility supervision meet highest industry standards. The Photovoltaic Platform also conducted detailed performance analysis of a medium scale photovoltaic power plant installed by a utility company and detected design and installation flaws that explained lower then expected power output. Uniqueness of Photovoltaic Platform experts' competences was also underlined with participation in development of large scale thin-film photovoltaic modules factory concept for one of the largest Polish companies. The Photovoltaic Platform also assists the BOS Foundation in dissemination of knowledge on distributed prosumer energy sources.

Broad knowledge of polish photovoltaic market development provides the Photovoltaic Platform basis for further development of competences of the photovoltaic teams at Warsaw University of Technology in connection with identified needs of the industry. In parallel with involvement in the cooperation with business partners the Photovoltaic Platform teams remain engaged in a number of research project.

Electronic Materials and Microsystem Technology Division

6. DEGREES AWARDED

6.1. D.Sc. Degrees

[DSc1] Mateusz Śmietana, **Technology of nano-coated long-period gratings (LPGs) for sensing applications**, (Technologia światłowodowych siatek długookresowych (ang. long-period grating, LPG) z pokryciami cienkowarstwowymi dla zastosowań czujnikowych), 28 January 2014

6.2. Ph.D. Degrees

[PhD1] Katarzyna Ławniczuk, **Multiwavelength transmitters in generic photonic integration technologies**, supervisors: Meint K. Smit, Paweł Szczepański, 22 January 2014

[PhD2] Stanisław Stopiński, **InP-based photonic integrated circuits for high-speed data readout systems**, supervisors: Meint K. Smit, Michał Malinowski, Xaveer J.M. Leijtens, Ryszard Piramidowicz, 3 December 2014

6.3. M.Sc. Degrees

[MSc1] Kamil Ber, **Development of manufacturing technology of ultra-thin silicon layers for quantum structures**, (Opracowanie technologii wytwarzania ultracienkich warstw krzemowych dla struktur kwantowych), advisor: Romuald Beck, 05 September 2014

[MSc2] Łukasz Chrzanowski, **Analysis of operation of a photovoltaic system with thin-film amorphous silicon modules**, (Analiza pracy systemu fotowoltaicznego z modułami cienkowarstwowymi z krzemu amorficznego), advisor: Stanisław Pietruszko, 28 November 2014

[MSc3] Mariusz Derlecki, **Implementation of intermediate frequency circuit for Bluetooth receiver in UMC MOS 130 nm technology**, (Realizacja toru pośredniej częstotliwości odbiornika Bluetooth w technologii UMC CMOS 130 nm), advisor: Tomasz Marek Borejko, 27 June 2014

[MSc4] Tomasz Marek Drążewski, **Magnetron Sputtering deposited thin Al2O3 films for sensor purposes**, (Warstwy Al_2O_3 wytwarzane metodą rozpylania magnetronowego na potrzeby sensoryki), advisor: Piotr Firek, 23 October 2014

[MSc5] Artur Fronk, **Methods of synchronous signal processing for microliquid optoelectronic sensors**, (Metody synchronicznego przetwarzania sygnałów dla mikrocieczowych czujników optoelektronicznych), advisor: Michał Borecki, 28 November 2014

[MSc6] Kamil Józef Gaweł, **Emission properties of crystal YAM doped with europium ions**, (Właściwości emisyjne kryształu YAM domieszkowanego jonami europu), advisor: Marcin Piotr Kaczkan, 17 October 2014

[MSc7] Jan Józef Grabiński, **Method for shortennig settling time in phase locked loop**, (Metoda skracania czasu ustalania się pętli sprzężenia fazowego), advisor: Zbigniew Jaworski, 19 September 2014

[MSc8] Paweł Klata, **Fabrication and characterization of superconducting Nb(Ti)N films of nanometer thickness**, (Wytwarzanie i charakteryzacja warstw nadprzewodzących Nb(Ti)N o nanometrowych grubościach), advisor: Ryszard Kisiel, 14 March 2014

[MSc9] Beata Kowalska, **Selected problems of scaling transistor VeSFET**, (Wybrane problemy skalowania tranzystora VeSFET), advisor: Andrzej Pfitzner, 17 October 2014

[MSc10] Michał Ksionek, **Examining the possibility of using laser to create patterns in thick-film layers**, (Badanie możliwości zastosowania lasera do wytwarzania wzorów w grubych warstwach), advisor: Jerzy Kalenik, 23 October 2014

[MSc11] Marcin Malinowski, **Project and implementation of high accuracy global positioning system using reference network stations ASG-EUPOS and inertial navigation system**, (Projekt i realizacja układu precyzyjnego pozycjonowania przestrzennego z wykorzystaniem sieci stacji referencyjnych ASG-EUPOS oraz nawigacji bezwładnościowej), advisor: Witold Pleskacz, 27 June 2014

[MSc12] Daniel Gracjan Pietroń, **Realization of the Bluetooth receiver RF front-end in the CMOS-RF 130 nm technology**, (Realizacja toru wielkiej częstotliwości odbiornika Bluetooth w technologii CMOS-RF 130nm), advisor: Tomasz Marek Borejko, 10 October 2014

[MSc13] Bartłomiej Stonio, **The technology and characterization of the MISFET structures with AIN layer as a gate dielectric**, (Technologia i charakteryzacja struktur MISFET z warstwą AIN jako dielektryk bramkowy), advisor: Piotr Firek, 27 June 2014

[MSc14] Jerzy Andrzej Szałygin, **Two-dimensional approximations of a VeSFET transistor's characteristics, having regard to a distortions of a shape of the channel**, (Dwuwymiarowe aproksymacje charakterystyk tranzystora VeSFET z uwzględnieniem zaburzeń kształtu kanału), advisor: Andrzej Pfitzner, 23 October 2014

[MSc15] Piotr Wiśniewski, **Modeling of admittance characteristics of MOS transistor with ultrathin gate dielectric**, (Modelowanie charakterystyk admitancyjnych tranzystora MOS z ultracienkim dielektrykiem), advisor: Bogdan Majkusiak, 07 February 2014

[MSc16] Piotr Adam Wysokiński, **Fabrication and characterization of thin HfO N films for ISFET transistor application**, (Wytwarzanie i charakteryzacja cienkich warstw HfO N na potrzeby tranzystora ISFET), advisor: Piotr Firek, 07 February 2014

[MSc17] Jacek Zawistowski, **Registration of three-dimentional images using polarization methods**, (Rejestracja trójwymiarowych obrazów z wykorzystaniem metod polaryzacyjnych), advisor: Piotr Garbat, 21 February 2014

[MSc18] Mateusz Zgierski, **Adder circuits based on VeSFET transistors**, (Układy sumatorów zbudowane z tranzystorów VeSFET), advisor: Andrzej Pfitzner, 17 October 2014

6.4. B.Sc. Degrees

[BSc1] Piotr Łukasz Bieliński, **Crystallization of ultrathin silicon layers in double-barrier structure with high-k dielectrics**, (Rekrystalizacja ultracienkich warstw krzemowych w strukturze dwubarierowej z dielektrykami o wysokiej stałej dielektrycznej), advisor: Romuald Beck, 13 February 2014

[BSc2] Piotr Borowy, **Microprocessor system for measuring meteorogical value using PSoC chip**, (System mikro-procesorowy do pomiaru podstawowych wielkości meteorologicznych zrealizowany z wykorzystaniem układu PSoC), advisor: Marek Niewiński, 19 September 2014

[BSc3] Marcin Józef Bychawski, **Implementing a library of functions which execute the process of tracking navigation data transmitted by the GPS or Galileo systems, designated to work with the GNSS receiver**, (Implementacja biblioteki funkcji języka C do śledzenia danych nawigacyjnych systemów Galileo i GPS dla scalonego odbiornika GNSS), advisor: Tomasz Marek Borejko, 13 February 2014

[BSc4] Dariusz Adam Chociej, **A study of crosstalk 3D and contrast 3D in LCD and PDP displays**, (Badanie parametrów przesłuchu 3D i kontrastu 3D dla telewizorów LCD i PDP), advisor: Piotr Garbat, 13 February 2014

[BSc5] Adam Wiesław Dzięcioł, **Test stand for the determination of image quality indicator of digital video recording system** (Stanowisko testowe do badania jakości odwzorowania w cyfrowych systemach rejestracji obrazu), advisor: Marek Sutkowski, 13 February 2014

[BSc6] Jarosław Andrzej Jaworski, **Version control system project for CAD database with usage of SVN (Subversion)**, (Projekt systemu kontroli wersji dla bazy danych środowiska projektowania CAD z wykorzystaniem SVN (Subversion)), advisor: Tomasz Marek Borejko, 10 October 2014

[BSc7] Jakub Jusza, **Fiber laser powered by solar radiation**, (Laser włóknowy zasilany promieniowaniem słonecznym), advisor: Ryszard Piramidowicz, 21 February 2014

[BSc8] Maciej Marek Kalisiak, **Fiber Bragg gratings for short wavelength spectral range**, (Światłowodowe siatki Bragga na zakres krótkofalowy), advisor: Ryszard Piramidowicz, 10 October 2014

[BSc9] Maciej Wincenty Kamiński, **Etching of the tytanium oxide thin films**, (Trawienie cienkich warstw dwutlenku tytanu metodą RIE), advisor: Piotr Firek, 26 September 2014

[BSc10] Jeonggil Kim, **Fabrication and characterization of the MOS tunnel diode**, advisor: Bogdan Majkusiak, 07 October 2014

[BSc11] Patryk Paweł Kłoczko, **Design of the functional model of Bluetooth device**, (Opracowanie modelu funkcjonalnego urządzenia Bluetooth), advisor: Witold Pleskacz, 26 September 2014

[BSc12] Michał Koc, **Website design microprocessor technology laboratory**, (Projekt strony internetowej laboratorium techniki mikroprocesorowej), advisor: Sławomir Szostak, 13 February 2014

[BSc13] Paweł Marek Korb, **Optimizing the deposition process of the silicon oxide by PECVD in view of the oxygen content in the produced layer**, (Optymalizacja procesu osadzania tlenku krzemu metodą PECVD pod kątem zawartości tlenu w wytworzonej warstwie), advisor: Romuald Beck, 13 February 2014

[BSc14] Krzysztof Robert Kowal, **An analog-digital data acquisition card made with the use of PSoC chip**, (Karta akwizycji danych analogowo-cyfrowych zrealizowana z wykorzystaniem układu PSoC), advisor: Marek Niewiński, 27 June 2014

[BSc15] Emilia Kraśko, **Resistance research of the Ti-Au contacts to graphene CVC on SiC background**, (Badanie rezystancji kontaktów Ti-Au do grafenu CVD na SiC), advisor: Jan Szmidt, 19 September 2014

[BSc16] Maciej Michał Kubiak, **Design and creation of software to make presentation and speaking**, (Projekt i wykonanie oprogramowania wspierającego tworzenie prezentacji i prelekcje), advisor: Krzysztof Michał Madziar, 10 October 2014

[BSc17] Thanh Tung Le, **Implementation of algorithm in fringe pattern analysis in FPGA**, (Implementacja algorytmu przetwarzania obrazów prążkowych w układzie FPGA), advisor: Piotr Garbat, 13 February 2014

[BSc18] Bartosz Maciej Michalak, **Fabrication and testing of optical fiber structures with silicon nitride nano-overlay for bio-sensing applications**, (Wytwarzanie i badanie struktur światłowodowych z nanowarstwami azotku krzemu na potrzeby biosensoryki), advisor: Mateusz Jakub Śmietana, 19 September 2014

[BSc19] Maciej Mateusz Możejko, **Measurement and analysis of fluorescence fading in dielectric crystals doped with Pr^{3+} ions**, (Badanie i analiza zaników fluorescencji kryształów dielektrycznych domieszkowanych jonami Pr^{3+}), advisor: Marcin Piotr Kaczkan, 26 September 2014

[BSc20] Łukasz Aleksander Nawrot, **Camera remote control module**, (Moduł zdalnej kontroli aparatu fotograficznego), advisor: Marek Sutkowski, 13 February 2014

[BSc21] Magdalena Anna Peisert, **Analysis of the properties of the VeSFET transistor for use in the sensor array**, (Analiza właściwości tranzystora VeSFET pod kątem zastosowania w matrycy czujnikowej), advisor: Andrzej Pfitzner, 23 October 2014

[BSc22] Bartosz Polakowski, **Electronic book template application for mobile devices**, (Projekt szablonu podręcznika elektronicznego na urządzenia mobilne), advisor: Elżbieta Piwowarska, 13 December 2013

[BSc23] Jakub Rafał Rzepliński, **Automated retuning system parametric laser radiation generator**, (Układ zautomatyzowanego przestrajania parametrycznego generatora promieniowania laserowego), advisor: Ryszard Piramidowicz, 10 October 2014

[BSc24] Emil Siejak, **Characterization of fiber-optic elements using optical frequency domain reflectometry method**, (Pomiary elementów optyki światłowodowej metodą reflektometrii optycznej w dziedzinie częstotliwości), advisor: Ryszard Piramidowicz, 26 September 2014

DEGREES AWARDED

[BSc25] Konrad Sośnicki, **Project optic network with high bandwidth**, (Projekt sieci światłowodowej o dużej przepustowości), advisor: Agnieszka Szymańska, 26 September 2014

[BSc26] Jacek Jakub Szuba, **The design of digital to analog converter in UMC 65nm technology**, (Przetwornik cyfrowo analogowy w tehnologii 65 nm), advisor: Zbigniew Jaworski, 27 June 2014

[BSc27] Paweł Stanisław Wiecha, **Modeling selected Bluetooth physical layer digital blocks using the Verilog hardware description language**, (Implementacja wybranych cyfrowych bloków warstwy fizycznej standardu Bluetooth w języku opisu sprzętu), advisor: Witold Pleskacz, 26 September 2014

[BSc28] Wiktor Marian Wilczko, **Implementation of fuzzy logic controller in PSoC system**, (Realizacja sterownika rozmytego w układzie PSoC), advisor: Andrzej Wielgus, 26 September 2014

7. PUBLICATIONS

7.1. Scientific and Technical Papers published in Journals Included in the ISI[1] Database

NUMBER	JOURNAL	AUTHORS	TITLE	DOI	VOLUME	PAGES
[Pub1]	ACS Applied Materials & Interfaces	Taube A., Judek J., Jastrzębski C., Dużyńska A., Świtkowski K., Zdrojek M.	Temperature-dependent nonlinear phonon shifts in a supported MoS 2 monolayer	10.1021/am502359k	vol. 6 no. 12	8959–8963
[Pub2]	Acta Physica Polonica A	Król K., Sochacki M., Szmidt J.	Investigation on the Mechanisms of Nitrogen Shallow Implantation Influence on Trap Properties of SiO_2/n-Type 4H-SiC Interface	10.12693/APhysPolA.125.1033	vol. 125 no. 4	1033–1037
[Pub3]	Applied Physics A-Materials Science & Processing	Bogdanowicz R., Śmietana M., Gnyba M., Gołuński Ł., Ryl J., Gardas M.	Optical and structural properties of polycrystalline CVD diamond films grown on fused silica optical fibres pre-treated by high-power sonication seeding	10.1007/s00339-014-8355-x	no. 116	1927–1937
[Pub4]	Applied Physics Letters	Krupka J., Judek J., Jastrzębski C., Ciuk T., Wosik J., Zdrojek M.	Microwave complex conductivity of the YBCO thin films as a function of static external magnetic field	10.1063/1.4868305	vol. 104 no. 10	102603,1–4
[Pub5]	Applied Surface Science	Szymańska M., Gierałtowska S., Wachnicki Ł., Grobelny M., Makowska K., Mroczyński R.	Effect of reactive magnetron sputtering parameters on structural and electrical properties of hafnium oxide thin films	10.1016/j.apsusc.2014.01.155	vol. 301	28–33
[Pub6]	Artificial Intelligence in Medicine	Bardossy A., Blinowska A., Kuźmicz W., Ollitrault J., Lewandowski M., Przybylski A., Jaworski Z.	Fuzzy logic-based diagnostic algorithm for implantable cardioverter defibrillators	10.1016/j.artmed.2013.12.004	no. 60	113–121
[Pub7]	IEEE Journal of Quantum Electronics	Koba M., Osuch T., Szczepański P.	Threshold Mode Analysis of Two-dimensional Square and Triangular Lattice Gain and Index Coupled Photonic Crystal Lasers	10.1109/JQE.2014.2325820	vol. 50 no. 7	554–562
[Pub8]	IEEE Photonics Technology Letters	Ławniczuk K., Kazmierski C., Wale M., Piramidowicz R., Szczepański P., Smit M., Leijtens X.	AWG-Based Photonic Transmitter With DBR Mirrors and Mach-Zehnder Modulators	10.1109/LPT.2014.2303496	vol. 26 no. 5	710–713
[Pub9]	IEEE Transactions on Semiconductor Manufacturing	Krupka J., Judek J.	RF Capacitive Spectroscopy for Contactless Measurements of Resistivity Profiles in Highly Resistive Semiconductor Wafers	10.1109/TSM.2014.2352301	vol. 27 no. 4	530–538
[Pub10]	Japanese Journal of Applied Physics	Dębowska A., Śmietana M., Mikulic P., Bock W.	High temperature nano-coated electric-arc-induced long-period gratings working at the dispersion turning point for refractive index sensing	10.7567/JJAP.53.08ME01	no. 53	1–5
[Pub11]	Journal of Alloys and Compounds	Kaczkan M., Boruc Z., Turczyński S., Malinowski M.	Effect of temperature on the luminescence of Sm^{3+} ions in YAM crystals	10.1016/j.jallcom.2014.05.186	vol. 612	149–153
[Pub12]	Journal of Crystal Growth	Teklińska D., Grodecki K., Jóźwik-Biała I., Caban P., Olszyna A., Strupiński W.	The influence of pressure on growth of 3C-SiC heteroepitaxial layers on silicon substrates	10.1016/j.jcrysgro.2013.11.087	vol. 401	542–546

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[Pub13]	Journal of Crystal Growth	Racka K., Tymicki E., Grasza K., Jakieła R., Pisarek M., Surma B., Avdonin A., Skupiński P., Krupka J.	Growth of SiC by PVT method with different sources for doping by a cerium impurity, CeO_2 or $CeSi_2$	10.1016/j.jcrysgro.2014.02.041	vol. 401	677–680
[Pub14]	Journal of Lightwave Technology	Stopiński S., Malinowski M., Piramidowicz R., Kazmierski C., Smit M., Leijtens X.	Photonic Integrated Multichannel WDM Modulators for Data Read-Out Units	10.1109/JLT.2014.2354240	vol. 32 no. 23	3879––3887
[Pub15]	Journal of Physics D: Applied Physics	Milewski J., Borecki M., Kalenik J., Król K.	Thick Film Heater for Sensor Application	10.1088/1742-6596/494/1/012014	no. 494	1–6
[Pub16]	Journal of Semiconductor Technology and Science	Smit M., Leijtens X., Ambrosius H., Bente E., Tol J., Smalbrugge B., Vries T., Geluk E., Bolk J., Veldhoven R., Augustin L., Thijs P., D'Agostino D., Rabbani H., Ławniczuk K., Stopiński S., Tahvili S. et al.	An introduction to InP-based generic integration technology	10.1088/0268-1242/29/8/083001	vol. 29 no. 8	083001,1–41
[Pub17]	Materials, MDPIAG	Śmietana M., Mroczyński R., Kwietniewski N.	Effect of Sample Elevation in Radio Frequency Plasma Enhanced Chemical Vapor Deposition (RF PECVD) Reactor on Optical Properties and Deposition Rate of Silicon Nitride Thin Films	10.3390/ma7021249	vol. 7 no. 2	1249––1260
[Pub18]	Measurement Science & Technology	Śmietana M., Koba M., Mikulic P., Bock W.	Tuning properties of long-period gratings by plasma post-processing of their diamond-like carbon nano-overlays	10.1088/0957-0233/25/11/114001	vol. 25 no. 11	114001,1–7
[Pub19]	Microelectronic Engineering	Mroczyński R., Jasiński J., Gottlob H., Schmidt M.	Double gate dielectric stacks with Gd_2O_3 layer for application in NVSM devices	10.1016/j.mee.2013.11.001	vol. 115	61–65
[Pub20]	Microelectronics Journal	Kasprowicz D., Wada H.	Methods for automated detection of plagiarism in integrated-circuit layouts	10.1016/j.mejo.2014.04.023	no. 45	1212––1219
[Pub21]	Nuclear Instruments & Methods in Physics Research. Section B: Beam Interactions With Materials and Atoms	Krupka J., Karcz W., Avdeyev S., Kamiński P., Kozłowski R.	Electrical properties of deuteron irradiated high resistivity silicon	10.1016/j.nimb.2014.01.021	vol. 325	107–114
[Pub22]	Optical Materials	Jusza A., Anders K., Polis P., Stępien R., Lipińska L., Piramidowicz R.	Luminescent properties in the visible of Er^{3+}/Yb^{3+} activated composite materials	10.1016/j.optmat.2014.03.018	vol. 36 no. 10	1749––1753
[Pub23]	Optics Express	Kujawińska M., Kozacki T., Falldorf C., Meeser T., Hennelly B., Garbat P., Zaperty W., Niemiela M., Finke G., Kowiel M., Naughton T.	Multiwavefront digital holographic television	10.1364/OE.22.002324	vol. 22 no. 3	2324––2336
[Pub24]		Śmietana M., Koba M., Mikulic P., Bock W.	Measurements of reactive ion etching process effect using long-period fiber gratings	10.1364/OE.22.005986	vol. 22 no. 5	5986––5994
[Pub25]	Physica Status Solidi B-Basic Solid State Physics	Bugajski M., Gutowski P., Karbownik P., Kolek A., Halda G., Pierścińska K., Pierścińska D., Kubacka-Traczyk J., Sankowska I., TrajnerowiczA., Kosiel K., Szerling A., Grzonka J., Kurzydłowski K., Slight T., Meredith W.	Mid-IR quantum cascade lasers: Device technology and non-equilibrium Green's function modelling of electro-optical characteristics	10.1002/pssb.201470135	vol. 251 no. 6	1144––1157

[Pub26]	Physica Status Solidi. A: Applications and Materials Science	Krogulski K., Śmietana M., Michalak B., Dębowska A., Dudek M., Witkowski B., Mikulic P., Bock W.	Properties of diamond-like carbon nano-coating deposited with RF PECVD method on UV-induced long-period fibre gratings	10.1002/pssa.201431235	vol. 211 no. 10	2307–2312
[Pub27]	Przemysł Chemiczny	Łoś P., Łukomska A., Kowalska S., Jeziórska R., Krupka J.	Kompozyty polimerowe z metalicznymi napełniaczami do ekranowania pola elektromagnetycznego	10.12916/przemchem.2014.XX	vol. 93 no. 10	1707–1711
[Pub28]	Review of Scientific Instruments	Boruc Z., Gawlik G., Fetliński B., Kaczkan M., Malinowski M.	Temperature dependence of Er^{3+} ionoluminescence and photoluminescence in Gd_2O_3:Bi nanopowder	10.1063/1.4880456	vol. 85 no. 6	064901,1-5
[Pub29]		Le Floch J., Fan Y., Humbert G., Shan Q., Férachou D., Bara-Maillet R., Aubourg M., Hartnett J., Madrangeas V., Cros D., Blondy J., KrupkaJ., Tobar M.	Dielectric material characterization techniques and designs of high-Q resonators for applications from micro to millimeter-waves frequencies applicable at room and cryogenic temperatures	10.1063/1.4867461	vol. 85 no. 3	031301,1–13
[Pub30]	Solid-State Electronics	Borysiewicz M., Myśliwiec M., Gołaszewska K., Jakieła R., Dynowska E., Kamińska E., Piotrowska A.	Thermal stability of multilayer Ti_2AlN-based ohmic contacts to n-GaN in ambient air	10.1016/j.sse.2014.01.006	vol. 94	15–19
[Pub31]		Gelczuk Ł., Dąbrowska-Szata M., Sochacki M., Szmidt J.	Characterization of deep electron traps in 4H-SiC Junction Barrier Schottky rectifiers	10.1016/j.sse.2014.02.008		56–60
[Pub32]	Surface and Interface Analysis	Kalisz M., Szymańska M., Dębowska A., Michalak B., Brzozowska E., Górska-Frączak S., Śmietana M.	Influence of biofunctionalization process on properties of silicon oxynitride substrate layer	10.1002/sia.5379	vol. 46 no. 10–11	1086–1089
[Pub33]		Mońko W., Szymańska M., Śmietana M., Kalisz M.	Simulation of nanoindentation experiments of single-layer and double-layer thin films using finite element method	10.1002/sia.5473		1071–1076
[Pub34]	The European Physical Journal Plus	Salski B., Krupka J., Kopyt P.	Measurements of Sheet Resistance of GaN Films on a Dielectric Substrate	10.1140/epjp/i2014-14184-1	vol. 129 no. 184	1–9

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

NUMBER	JOURNAL	AUTHORS	TITLE	DOI	VOLUME	PAGES
[Pub35]	Advances in Science and Technology, Scientific.Net	Mazierska J., Leong K., Ledenyov D., Rains A., Zuchowski N., Krupka J.	Microwave Measurements of Surface Resistance and Complex Conductivity of NdBaCuO Films	10.4028/www.scientific.net/AST.95.162	vol. 95	162–168
[Pub36]	Elektronika – konstrukcje, technologie, zastosowania	Chodun R., Nowakowska-Langier K., Okrasa S., Firek P., Szmidt J., Zdunek K.	Zastosowanie metody IPD do syntezy warstw c-AlN	10.15199/ELE-2014-159	vol. 55 no. 10	11–13
[Pub37]		Król K., Sochacki M., Szmidt J.	Utlenianie węglika krzemu: charakteryzacja procesu i metody symulacji kinetyki	10.15199/ELE-2014-086	vol. 55 no. 7	144–148
[Pub38]	Forum Akademickie	Woźnicki J.	Nowe obszary wolności		no. 7-8	30–31

[Pub39]	International Journal of Electronics and Telecommunications	Taube A., Sochacki M., Szmidt J., Kamińska E., Piotrowska A.	Modelling and Simulation of Normally-Off AlGaN/GaN MOS-HEMTs	10.2478/eletel-2014-0032	vol. 60 no. 3	253–258
[Pub40]	International Journal On Advances in Systems and Measurements	Borecki M., Doroz P., Prus P., Pszczółkowski P., Szmidt J., Frydrych J., Korwin-Pawlowski M., Kociubiński A., Duk M.	Fiber Optic Capillary Sensor with Smart Optode for Rapid Testing of the Quality of Diesel and Biodiesel Fuel		vol. 7 no. 1&2	57–67
[Pub41]	Materials Research Society Symposium Proceedings	Taube A., Kozubal M., Kaczmarski J., Juchniewicz M., Barcz A., Dyczewski J., Jakieła R., Dynowska E., Borysiewicz M., Prystawko P., Jasiński J., Borowicz P., Kamińska E., Piotrowska A.	High resistivity isolation for AlGaN/GaN HEMT using Al double-implantation	10.1557/opl.2014.220	1635	9–14
[Pub42]	Mechanik: miesiecznik naukowo-techniczny	Król K., Taube A., Sochacki M., Szmidt J.	Analiza wpływu wybranych aspektów technologii wykonania tranzystora MOSFET na krytyczne parametry użytkowe		vol. 87 no. 7	337–342
[Pub43]	Procedia Engineering	Szymańska M., Krogulski K., Mikulic P., Bock W., Śmietana M.	Sensitivity of Long-period Gratings Modified by their Bending	10.1016/j.proeng.2014.11.377	vol. 87	1180––1183
[Pub44]	Przegląd Elektrotechniczny	Firek P., Głuszko G., Łukasiak L., Szmidt J., Jakubowski A., Sochacki M.	Charge pumping characterization of MISFETs with $SiO_2/BaTiO_3$ as a gate stack	10.12915/pe.2014.09.08	vol. 90 no. 9	26–28
[Pub45]	Przegląd Telekomunikacyjny Wiadomości Telekomunikacyjne	Borejko T., Siwiec K., Berent A., Marcinek K., Łuczyk A., Grądzki J., Koter A., Pieńkowski D., Pleskacz W.	Dwusystemowy odbiornik sygnałów nawigacji satelitarnej GALILEO i GPS w technologii nanometrowej CMOS do dokładnego pozycjonowania obiektów przenośnych		no. 6	634–637
[Pub46]	Studia z Polityki Publicznej	Woźnicki J.	Dedykowane normy konstytucyjne i dobre praktyki w realizacji polityki publicznej wobec sektora wiedzy		vol. 1 no. 1	11–32
[Pub47]	Zagadnienia Informacji Naukowej	Muraszkiewicz M., Szmidt J., Zaremba K.	SYNAT i ΩΨR – ku ekosystemowi wsparcia informacyjnego nauki i uczelni polskich		vol. 52 no. 2	7–22

7.3. Scientific and Technical Papers Published in Conference Proceedings

NUMBER	CONFERENCE	AUTHORS	TITLE	CITY, COUNTRY	PAGES
[Pub48]	4th National Conference on Nano- and Micromechanics, KKNM'14, July 08–10	Bieniek T., Janczyk G., Zając J., Ekwińska M., Marchewka M., Dobrowolski R., Grabiec P., Kociubiński A.	Design, modeling, simulation and characterization of MEMS cantilever beams for interconnect reliability in heterogeneous integrated systems	Wrocław, Poland	1–8
[Pub49]		Ekwińska M., Janczyk G., Bieniek T., Dariusz S., Dobrowolski R., Budzyński T., Domański K., Głuszko G., Tomaszewski D., Nieprzecki M., Wojciechowska K., Grabiec P.	Methodology of MEMS development on example of specialized MEMS microphone		1–15
[Pub50]	8th International Conference on Sensing Technology, ICST 2014, September 02–04	Krogulski K., Śmietana M., Michalak B., Dębowska A., Wachnicki Ł., Gierałtowska S., Godlewski M., Szymańska M., Mikulic P., Bock W.	Effect of TiO_2 nano-overlays deposited with atomic layer deposition on refractive index sensitivity of long-period gratings	Liverpool, Great Britain	573––577

[Pub51]	9th Conference Integrated Optics – Sensors, Sensing Structures and Methods IOS'2014, March 03–07	Anders K., Jusza A., Stopiński S., Szczepański P., Piramidowicz R.	Lossless optical splitter in integrated inP technology	Szczyrk, Poland	1
[Pub52]		Jusza A., Tymecki A., Stopiński S., Anders K., Szczepański P., Piramidowicz R.	Photonic integrated 2x8 switch for application in FTTx systems		1
[Pub53]		Michalak B., Śmietana M., Koba M.	Silicon nitride overlays deposited on optical fibers with RF PECVD method for sensing applications: overlay uniformity aspects		1
[Pub54]		Stopiński S., Jusza A., Osuch T., Szczepański P., Różanowski K., Lewandowski J., Piramidowicz R.	Photonic Integrated Circuit for Interrogating FBG-based Sensing Network		1
[Pub55]		Stopiński S., Ławniczuk K., Jusza A., Anders K., Szczepański P., Smit M., Leijtens X., Piramidowicz R.	Multi-wavelength transmitters in generic integration technology		1
[Pub56]	15th Conference on Optical Fibers and Their Applications, January 29–February 01	Jusza A., Łyszczek R., Mergo P., Piramidowicz R.	Visible emission properties of metal-organic complexes doped with dysprosium ions	Białystok – Lipowy Most, Poland	1
[Pub57]		Jusza A., Piramidowicz R.	RE^{3+}doped PMMA composites for applications in active polymer fibers		1
[Pub58]		Kociubiński A., Duk M., Teklińska D., Kwietniewski N., Sochacki M., Borecki M.	Fabrication and characterization of epitaxial 4H-SiC pn junctions		SPIE, 922804 pp. 1–6
[Pub59]		Mergo P., Łyszczek R., Broczkowska M., Jusza A., Gorgol A.	Three-dimensional coordination polymers of rare earth elements useful in active optical fibers technology		1–2
[Pub60]	15th International Conference on Thermal, Mechanical and Multi-Physics Simulation and Experiments in Microelectronics and Microsystems, EuroSimE 2014, April 07–09	Kisiel R., Guziewicz M., Myśliwiec M., Kraśniewski J., Janke W.	Thermal characteristics of SiC diode assembly to ceramic substrate	Ghent, Belgium,	1–4
[Pub61]	16th Photonics North Conference, Photonics North 2014, May 28–30	Brabant D., Koba M., Śmietana M., Bock W.	Analysis of Mode Transitions in a Long-Period Fiber Grating with a Nano-Overlay of Diamond-Like Carbon	Montréal, Canada	SPIE, 928810 pp. 1–8
[Pub62]	17th European Conference on Integrated Optics, ECIO 2014, June 24–27	Stopiński S., Malinowski M., Piramidowicz R., Gajanana D., Hoek M., Smit M., Leijtejs X.	Photonic integrated transceivers for data read-out systems	Nice, France	1–2
[Pub63]	17th International Conference on Luminescence and Optical Spectroscopy of Condensed Matter ICL 2014, July 13–18	Anders K., Piątkowski D., Dybała F., Piramidowicz R.	Infrared to visible up-conversion in erbium doped low phonon glasses-modelling and experimental studies	Wrocław, Poland	P–47
[Pub64]		Fetliński B., Boruc Z., Kaczkan M., Malinowski M., Lipińska L.	Sensibilisation of Pr^{3+} In YAM		P–189
[Pub65]		Jusza A., Golba A., Jureczko J., Tomczyk M., Polis P., Olszyna A., Kunicki A., Piramidowicz R.	Structural And Opticalbstudies On Aluminium Oxide Nanopowders Doped With Pr^{3+} Ions		P–323

[Pub66]	17th International Conference on Luminescence and Optical Spectroscopy of Condensed Matter, ICL 2014, July 13–18	Malinowski M., Boruc Z., Fetliński B., Kaczkan M., Turczyński S.	Structural and spectroscopic features of rare-earth activated $Y4Al_2O_9$ (YAM) crystals	Wrocław, Poland	I–13
[Pub67]		Piramidowicz R., Jusza A.	RE^{3+} Doed polymer nanocomposites – new material for visible light sources		O–98
[Pub68]		Suchocki A., Przybylinska H., Wittlin A., Berkowski M., Nowakowski P., Korona K., Ma C., Brik M., Suhak D., Syvorotka I., Kamińska A.,Sybilski P., Zorenko Y., Nikl M., Gorbenko V., Kucera M., Wajler A., Malinowski M.	Multicenters of Ce^{3+} ions in various garnets and perovskites studied by infrared and high pressure spectroscopy		I–19
[Pub69]	17th International Symposium on Design and Diagnostics of Electronic Circuits and Systems, IEEE DDECS 2014, April 23–25	Grodzicki A., Pleskacz W.	Multistage Low Ripple Charge Pump	Warsaw, Poland	93–98
[Pub70]		Wielgus A.	Heuristic Algorithm of Two-level Minimization of Fuzzy Logic Functions		302–305
[Pub71]	18th Workshop on Dielectrics in Microelectronics WoDiM 2014, June 9–11	Ber K., Beck R.	Analysis of competing processes of oxidation and recrystallization of amorphous silicon layers in double dielectric barrier ultra-thin structures	Kinsale Co Cork, Ireland	145–146
[Pub72]		Kalisz M., Szymańska M., Mroczyński R.	Effect of ultra-shallow fluorine and nitrogen implantation from r.f. plasma and its effect on electro-physical parameters of $Al/HfO_2/Si$ MOS structures		1–7
[Pub73]		Kalisz M., Szymańska M., Mroczyński R.	Reactive magnetron sputtered hafnium oxide layers (HfOx) for non-volatile semiconductor memory (NVSM) devices		1–7
[Pub74]		Tanous D., Mazurak A., Majkusiak B., Reinhard B.	Theoretical and Experimental Investigation of ncMOS Structures with Ge nanocrystals for Memory and Photonics Applications		163–164
[Pub75]	20th International Conference on Microwaves, Radar and Wireless Communications, MIKON 2014, June 16–18	Madziar K., Galwas B., Osuch T.	Fiber Bragg Gratings Based Tuning of an Optoelectronic Oscillator	Gdańsk, Poland	1–4
[Pub76]	21th International Conference "Mixed Design of Integrated Circuits and Systems", MIXDES 2014, June 19–21	Mierzwiński P.	Small Signal Performance of VES-BJT	Lublin, Poland	342–346
[Pub77]		Pfitzner A.	Improved Simple DC Model of Vertical-Slit Field-Effect Transistor (VeSFET)		323–327
[Pub78]		Pietroń D., Siwiec K., Kopański J., Pleskacz W.	Implementation of the Bluetooth Receiver RF Front-End in the CMOS-RF 130 nm Technology		230–235
[Pub79]		Staniewski M., Pfitzner A.	Usefulness of VeSTIC Devices for Low-Noise and Radiation Hard 3D Integrated Circuits		356–360
[Pub80]		Wiechowski Ł., Siwiec K., Kopański J., Pleskacz W.	Simulink Model of GFSK Demodulator Based onTime-to-Digital Converter		338–341
[Pub81]	23rd International Conference on Optical Fiber Sensors, OFS'23, June 02–06	Koba M., Śmietana M., Brzozowska E., Górska S., Mikulic P., Bock W.	Bacteriophage adhesin-coated long-period gratings for bacterial lipopolysaccharide recognition	Santander (Cantabria) Spain	SPIE, 915757, pp.1–4

[Pub82]	23rd International Conference on Optical Fiber Sensors, OFS'23, June 02–06	Michalak B., Śmietana M., Koba M.	Optical fiber refractometer based on silicon nitride nano-overlay deposited with PECVD method	Santander (Cantabria), Spain	SPIE, 91575A, pp.1–4
[Pub83]		Śmietana M., Koba M., Różycki-Bakon R.	Stack of PECVD silicon nitride nano-films on optical fiber end-face for refractive index sensing		SPIE, 91575F, pp.1–4
[Pub84]	24th International Travelling Summer School on Microwaves and Lightwaves, ITSS 2014, July 05–11	Fetliński B.	Rare Earth based Materials as Solar Spectra Converters for Photovoltaics Applications	Copenhagen/Lyngby, Denmark	1–14
[Pub85]		Galwas B.	Optical links for transmission of microwave signals		1–42
[Pub86]		Malinowski M.	Rare-earth Upconversion Luminescence for Optical Sensing		1–49
[Pub87]		Parka J.	Metamaterials from Microwave to Optical Range		1–90
[Pub88]	34th IEEE-SPIE Symposium: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments, 26 May– 1 June	Gęca M., Kociubiński A., Borecki M.	Analysis of local heating of liquid samples in multiparametric capillary sensors	Wilga, Poland	SPIE, 92900V, pp. 1–8
[Pub89]		Prus P., Borecki M., Korwin-Pawłowski M., Kociubiński A., Duk M.	Automatic detection of characteristic points and form of optical signals		SPIE, 929009, pp. 1–9
[Pub90]	37th International Spring Seminar on Electonics Technology, ISSE 2014, May 07–11	Kisiel R., Płatek B., Myśliwiec M.	Thermal Properties of Ag Sintered Layer Used as Interconnect Material in Microelectonics Packaging	Dresden, Germany	87–90
[Pub91]	38th International Conference of IMAPS-CPMT, IMAPS Poland 2014, September 21–24	Kisiel R., Guziewicz M., Myśliwiec M., Kwietniewski N.	Materials and Technological Aspects of High-Temperature SiC Package Reliability	Rzeszów-Czarna, Poland	1–4
[Pub92]		Kisiel R., Szczepański Z., Weremczuk J., Myśliwiec M., Piotrowski J., Kalinowski P.	Design and Technology of Flexible Connections for Low Temperature Applications		1–4
[Pub93]	39th International Conference. on Infrared, Millimeter and Terahertz Waves: IRMMW-THz 2014, September 14–19	Chodorow U., Chojnowska O., Garbat K., Jakub H., Parka J.	Liquid Crystal Materials with High Birefringence for THz Applications	Tucson, USA	M5-P12.2, pp.1–2
[Pub94]	Conference Urządzenia i Systemy Radioelektroniczne, October 28	Borejko T., Siwiec K., Marcinek K., Bernet A., Pleskacz W.	Polski, scalony dwusystemowy odbiornik GALILEO GPS do dokładnego pozycjonowania obiektów przenośnych	Jachranka, Poland	1–10
[Pub95]	Fifth International Conference on Sensor Device Technologies and Applications, SENSORDEVICES 2014, November 16-20	Borecki M., Szmidt J., Korwin-Pawłowski M., Duk M., Kociubiński A., Niemiec T., Szmidt M., Urbańska K.	Sensing of Essential Amino Acids Behaviour Under Fast Thermal Shocks in Liquid Water Environment	Lisbon, Portugal	32–38
[Pub96]	IEEE International 3D Systems Integration Conference, 3DIC'14, December 01–03	Bieniek T., Janczyk G., Ekwińska M., Budzyński T., Głuszko G., Grabiec P., Kociubiński A.	Novel Methodology for 3D MEMS-IC Design and Co-Simulation on MEMS Microphone Smart System Example	Kinsale Co Cork, Ireland	1–5
[Pub97]		Kociubiński A., Duk M., Bieniek T., Janczyk G., Borecki M.	Innovative SiC over Si photodiode based dual-band, 3D Integrated detector		1–4

[Pub98]	IEEE International Conference On Oxide Materials For Electronic Engineering, OMEE-2014, May 26–30	Suchocki A., Przybylinska H., Wittlin A., Berkowski M., Chong-Geng M., Brik M., Kamińska A., Sybilski P., Zorenko Y., Nikl M., Gorbenoko V.,Kucera M., Wajler A., Malinowski M.	Ce $^{3+}$ Multicenters in Selected Garnets, Perovskites, and Glasses	Lviv, Ukraine	125–126
[Pub99]	International Academic Conference on Education and E-learning (IAC-EeL 2014), August 07–08	Czejdo B., Baszun M.	Teaching Programming Online and E-Learning	Prague, Czech Republic	1–8
[Pub100]	International Conference AUTOMATION 2014, March 26–28	Petruk O., Szewczyk R., Ciuk T., Strupiński W., Salach J., Nowicki M., Pasternak I., Winiarski W., Trzcinka K.	Sensitivity and Offset Voltage Testing in the Hall-Effect Sensors Made of Graphene, in: Recent Advances in Automation, Robotics and Measuring Techniques	Warsaw, Poland	vol. 267, pp. 631––640
[Pub101]	International Workshop on Nitride Semiconductors, IWN 2014, August 24–29	Taube A., Kozubal M., Kaczmarski J., Barcz A., Wojtasiak W., Dyczewski J., Dynowska E., Borysiewicz M., Ekielski M., Juchniewicz M.,Grochowski J., Prystawko P., Zając M., Kucharski R., Kamińska E., Piotrowska A.	Ion Implantation for Isolation of AlGaN/GaN HEMTs Using C or Al	Wrocław, Poland	1
[Pub102]	KNU-BME-WUT Joint Workshop on ICT, October 22	Sanghwa Lee D., Jasiński J., Łukasiak L., Kim D., Hahm S.	Extraction of selected electrophysical parameters of GaN MIS-HEMTs	Daegu, South Korea	108–113
[Pub103]	Progress in Electromagnetics Research Symposium, PIERS 2014, August 25–28	Śmietana M., Koba M., Bock W.	Plasma-modified Optical Fiber Bio-sensors	Guangzhou (Canton), China	181
[Pub104]	SPIE Photonics Europe 2014, April 14–17	Anders K., Jusza A., Dybała F., Bercha A., Trzeciakowski W., Klimczak M., Piramidowicz R.	High-power pressure tuned laser diodes for application in laser spectroscopy of solids	Brussels, Belgium	SPIE, 9135–43, p.277
[Pub105]		Jusza A., Anders K., Dybała F., Bercha A., Trzeciakowski W., Piramidowicz R.	Up-conversion emission properties of thulium-doped low-phonon glasses		SPIE, 9135–68,p. 280
[Pub106]		Stopiński S., Gdula P., Nawrot M., Szczepański P., Leijtens X., Piramidowicz R.	4-channel photonic integrated transceiver for access networks		SPIE, 9133–13, p.214
[Pub107]	XIII Krajowa Konferencja Elektroniki, KKE 2014, June 09–13	Kalisz M., Mroczyński R.	Badanie wpływu częstotliwości plazmy wykorzystywanej w procesie ultra-płytkiej implantacji jonów azotu na parametry elektro-fizyczne struktur MOS	Darłówko Wschodnie, Poland	1–2

7.4. Scientific and Technical Books

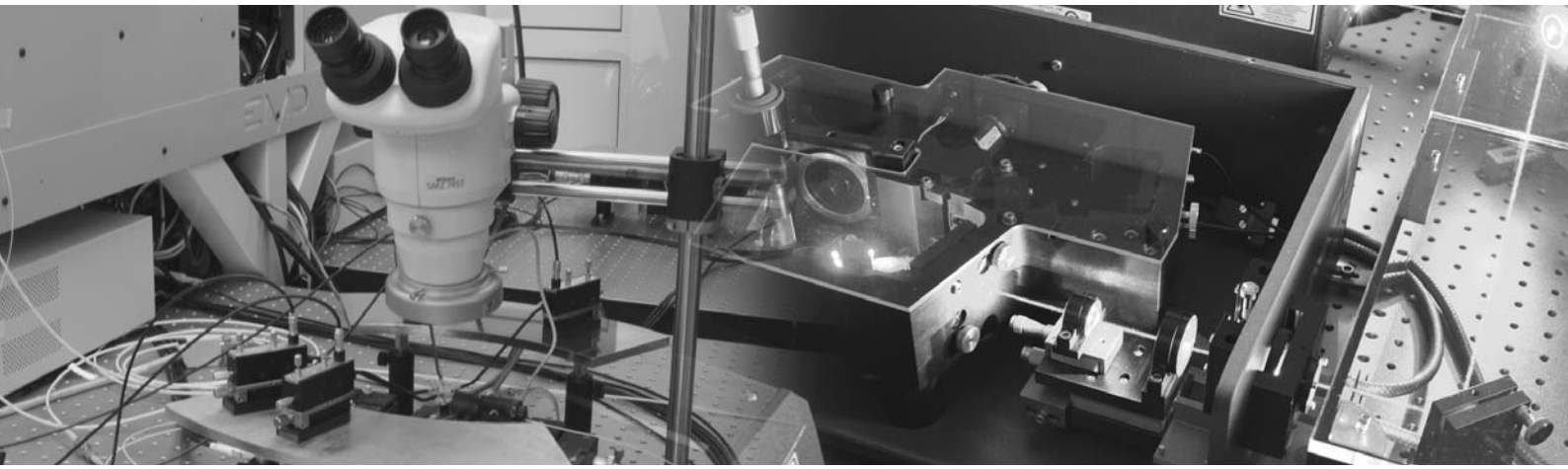
NUMBER	AUTHORS	PUBLISHER, ISBN	TITLE	PAGES
[Pub108]	Borejko T., Siwiec K., Berent A., Marcinek K., Grądzki J., Koter A., Pieńkowski D., Pleskacz W.	Wojskowa Akademia Techniczna, ISBN 978-83-7938-029-9	Bloki dwusystemowego, scalonego odbiornika sygnałów nawigacji satelitarnej Galileo i GPS w technologii nanometrowej CMOS do dokładnego pozycjonowania obiektów przenośnych, in: Urządzenia i Systemy Radioelektroniczne – Wybrane Problemy 3, Kawalec Adam, Witczak Andrzej (ed.)	261–288
[Pub109]	Firek P., Kalenik J., Szmidt J.	Wydawnictwo Uniwersytetu Warszawskiego, ISBN 978-83-235-1656-9	Technologia i właściwości kontaktów i mikropołączeń do warstw C-Pd, in: Warstwy nanokompozytowe węglowo-palladowe. Badania i technologia / Czerwosz Elżbieta (ed.)	64–74
[Pub110]	Marcinek K., Pleskacz W.	Wojskowa Akademia Techniczna, ISBN 978-83-7938-029-9	Architektura wielordzeniowego mikrokontrolera do zastosowań biomedycznych, in: Urządzenia i Systemy Radioelektroniczne – Wybrane Problemy 3 / Kawalec Adam, Witczak Andrzej (ed.)	443–454
[Pub111]	Werbowy A., Firek P., Kozłowski M., Szmidt J.	Wydawnictwo Uniwersytetu Warszawskiego, ISBN 978-83-235-1656-9	Technologia wytwarzania warstw DLC i DLC/C-Pd, in: Warstwy nanokompozytowe węglowo-palladowe. Badania i technologia / Czerwosz Elżbieta (ed.)	54–63
[Pub112]	Woźnicki J.	Wydawnictwo Uniwersytetu Jagiellońskiego, ISBN 978-83-233-3819-2	Uniwersytet jako kreacja instytucjonalna ambicji twórców i oczekiwań interesariuszy – w kierunku zmiany nieniszczącej, in: Idea uniwersytetu reaktywacja / Sztompka Piotr, Matuszek Krzysztof (ed.)	227–237

8. PATENTS

[Pat1] Borecki Michał, Bebłowska Maria, Kopczyński Krzysztof, Mierczyk Zygmunt, Szmidt Jan: **Semiconductor multilayer photodetector** (Półprzewodnikowy fotodetektor wielowarstwowy), Patent UP RP: Z-397020, 09-09-2014

[Pat2] Kalenik Jerzy, Mroczkowski Mateusz: **The electroluminescent structure with electroluminescent powder material** (Struktura elektroluminescencyjna z proszkowym materiałem o właściwościach elektroluminescencyjnych), Wynalazek, Zgłoszenie potwierdzone, Numer zgłoszenia: P-410251, Data zgłoszenia: 25-11-2014

[Pat3] Siwiec Krzysztof, Pleskacz Witold: **Low noise fractional-N frequency synthesizer** (Niskoszumny układ ułamkowej syntezy częstotliwości), zgłoszenie patentowe no. P-410584, 17-12-2014



Optoelectronics Division

9. REPORTS

NUMBER	AUTHORS	TITLE	TYPE
[Rep1]	Anders K.	IR-to-visible upconversion erbium fiber laser	**scientific report** from the project granted by the Warsaw University of Technology
[Rep2]	Anders K., Dybała F., Piramidowicz R.	Up-conversion properties of erbium doped low-phonon glasses under pressure-tuned IR laser diodes excitation	**poster**: 16th International Krutyń Summer School – Lanthanide-based photonic materials and structures: breakthrough applications and cutting edge systems
[Rep3]	Anders K., Jusza A., Stopiński S., Szczepański P., Piramidowicz R.	Lossless optical splitter in integrated InP technology	**poster**: 9th Conference Integrated Optics – Sensors, Sensing Structures and Methods, IOS 2014
[Rep4]	Borecki M.	Automatic detection of characteristics tracks of optical signals received in multiparametric capillary and optical fiber sensors	**presentation**: 34th IEEE-SPIE Symposium: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments
[Rep5]	Borecki M., Korwin-Pawłowski M., Duk M., Kociubiński A., Doroz P., Prus P., Pszczółkowski P., Szmidt J.	Capillary sensor of diesel and bio-diesel fuel quality using smart optrodes	**presentation**: 9th Conference Integrated Optics – Sensors, Sensing Structures and Methods, IOS 2014
[Rep6]	Brzozowska E., Górska S., Śmietana M., Koba M., Bock W.	Recognition of bacterial lipopolysaccharide using bacteriophage-adhesin-coated long-period gratings	**poster**: 24th Anniversary World Congress on Biosensors
[Rep7]	Ciuk T., Cakmakyapan S., Ozbay E., Pasternak I., Krajewska A., Caban P., Petruk O., Szewczyk R., Szmidt J., Strupiński W.	Własności transportowe grafenu epitaksjalnego i CVD na SiC	**presentation**: XIII Krajowa Konferencja Elektroniki, KKE 2014
[Rep8]	Dębowska A., Michalak B., Brzozowska E., Górska S., Mikulic P., Bock W., Śmietana M.	Biofunctionalization of silicon oxynitride overlay deposited on long-period gratings	**presentation**: 9th Conference Integrated Optics - Sensors, Sensing Structures and Methods, IOS 2014
[Rep9]	Firek P.	Highly sensitive ISFET matrix transistors with functional dielectrics on new generation	**scientific report** from the project granted by the National Science Centre
[Rep10]	Firek P., Głuszko G., Łukasiak L., Szmidt J., Jakubowski A., Sochacki M.	Charge pumping characterization of MISFETs with $SiO_2/BaTiO_3$ as a gate stack	**poster**: XIII Krajowa Konferencja Elektroniki, KKE 2014
[Rep11]	Firek P., Gronau R., Szmidt J.	Diamond-like carbon films - deposition and properties	**presentation**: 34th IEEE–SPIE Symposium: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments
[Rep12]	Firek P., Stonio B., Waskiewicz M., Szmidt J.	Technologia i właściwości struktur jonoczułych typu ISFET z podwójnym dielektrykiem bramkowym SiO_2/AlN	**presentation**: X Konferencja Techniki Próżni
[Rep13]	Gołaszewska K., Kruszka R., Myśliwiec M., Ekielski M., Jung W., Juchniewicz M., Piotrowski T., Wzorek M., Bar J., Dumania R., SzopniewskiZ., Ziółkowski M., Kamińska E., Piotrowska A., Sarzała R., Dems M., Wasiak M., Wojtas J., Mędrzycki R.	Wykonanie i weryfikacja parametrów funkcjonalnych diody elektroluminescencyjnej UV AlGaN/GaN	**presentation**: II Konferencja „Innowacyjne technologie wielofunkcyjnych materiałów i struktur dla nanoelektroniki, fotoniki, spintroniki i technik sensorowych" InTechFun,
[Rep14]	Golba A., Tomczyk M., Jusza A., Piramidowicz R.	Praseodymium doped Al_2O_3 nanopowders – new material for the visible light sources	**presentation**: 34th IEEE-SPIE Symposium: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments

[Rep15]	Grobelny M., Kalisz M., Szymańska M., Moćko W., Sochacki M., Szmidt J., Krogulski K., Zdrojek M., Świniarski M.	InGrafTi-grafen w motoryzacji	**presentation**: XIII Krajowa Konferencja Elektroniki, KKE 2014
[Rep16]	Grochowski J., Kaczmarski J., Taube A., Kamińska E., Piotrowska A.	Symulacje cienkowarstwowych tranzystorów polowych z kanałem z amorficznego In-Ga-Zn-O	**poster**: XIII Krajowa Konferencja Elektroniki, KKE 2014
[Rep17]	Guziewicz M., Gołaszewska K., Kruszka R., Myśliwiec M., Piotrowska A., Jastrzębski C., Domagala J.	Effect of thermal ohmic contact formation on strain in AlGaN/GaN structure	**poster**: 38th International Conference of IMAPS-CPMT, IMAPS Poland 2014
[Rep18]	Jaroszewicz Z., Szczepański P., Kossek T., Osuch T., Koba M., Marszalec M., Lusawa M.	Badania nad nowymi strukturami i elementami fotonicznymi dla telekomunikacji i metrologii oraz badania nad zastosowaniem układów optyki zintegrowanej w porównaniach atomowych wzorców czasu	**scientific report** from the project granted by the National Institute of Telecommunications, no. 12300014, pp. 1–42
[Rep19]	Jasiński J.	Oscilloscope with logic analyzer	**scientific report** from the project granted by the Warsaw University of Technology
[Rep20]	Jusza A.	Composite polymer fibers doped with RE^{33++} ions – new generation of active media for visible light sources	**scientific report** from the project granted by the Innovative Economy Programme (POIG) and The Foundation for Polish Science (VENTURES/2012-10/3)
[Rep21]	Jusza A., Łyszczek R., Piramidowicz R.	Polymer nanocomposites based on Dy^{3+} doped metal-organic complexes	**poster**: 16th International Krutyń Summer School – Lanthanide-based photonic materials and structures: breakthrough applications and cutting edge systems
[Rep22]	Jusza A., Tymecki A., Stopiński S., Anders K., Szczepański P., Piramidowicz R.	Photonic integrated 2x8 switch for application in FTTx systems	**poster**: 9th Conference Integrated Optics – Sensors, Sensing Structures and Methods, IOS 2014
[Rep23]	Kaczmarski J., Grochowski J., Kamińska E., Taube A., Kozubal M., Wojciech J., Piotrowska A., Elżbieta D.	Diody Schottky'ego i tranzystory MESFET na bazie In-Ga-Zn-O z przezroczystą bramką Ru-Si-O	**presentation**: XIII Krajowa Konferencja Elektroniki, KKE 2014
[Rep24]	Kalenik J., Mroczkowski M., Firek P., Czerwosz E., Szmidt J.	Deterioration of electronolumonescent lamps properties	**poster**: 38th International Conference of IMAPS-CPMT, IMAPS Poland 2014
[Rep25]	Kalisiak M., Markowski K., Anders K., Osuch T., Piramidowicz R.	Short wavelength fiber Bragg gratings for laser applications	**presentation**: 34th IEEE–SPIE Symposium: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments
[Rep26]	Kalisz M., Mroczyński R.	Badanie wpływu częstotliwości plazmy wykorzystywanej w procesie ultra-płytkiej implantacji jonówazotu na parametry elektro-fizycznestruktur MOS	**poster**: XIII Krajowa Konferencja Elektroniki, KKE 2014
[Rep27]	Kalisz M., Szymańska M., Mroczyński R.	Effect of ultra-shallow fluorine and nitrogen implantation from r.f. plasma on electrical properties of MIS structures with HfOx gate dielectric layers	**poster**: 18th Workshop on Dielectrics in Microelectronics, WoDiM 2014
[Rep28]	Kiełbasiński K., Jasiński J., Kalenik J., Czerwosz E., Szmidt J., Firek P.	Prototype of Hydrogen Detector	**presentation**: 34th IEEE–SPIE Symposium: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments
[Rep29]	Kisiel R.	New processes and technology for assembly and hermetic SiC high temperature packages	**scientific report** from the project granted by the National Science Centre

[Rep30]	Kisiel R., Guziewicz M., Myśliwiec M., Kwietniewski N.	Materials and Technological Aspects of High-Temperature SiC Package Reliability	**presentation**: 38th International Conference of IMAPS-CPMT, IMAPS Poland 2014
[Rep31]	Kisiel R., Szczepański Z., Weremczuk J., Myśliwiec M., Piotrowski J., Kalinowski P.	Design and Technology of Flexible Connections for Low Temperature Applications	**poster**: 38th International Conference of IMAPS-CPMT, IMAPS Poland 2014
[Rep32]	Koba M.	Modeling of light generation in photonic crystal lasers based on coupled mode theory	**scientific report** from the project granted by Ministry of Science and Higher education
[Rep33]	Krogulski K., Szymańska M., Mikulic P., Bock W., Śmietana M.	Tuning bending sensitivity of long-period gratings by wet etching	**presentation**: 9th Conference Integrated Optics – Sensors, Sensing Structures and Methods, IOS 2014
[Rep34]	Kuźmicz W., Pfitzner A.	VESTIC: a new manufacturing technology for integrated circuits	**scientific report** from the project granted by the National Centre for Research and Development
[Rep35]	Lelit M., Stopiński S., Piramidowicz R.	Tunable lasers in photonic integration technologies	**presentation**: 34th IEEE-SPIE Symposium: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments
[Rep36]	Madziar K.	Nonlinear Properties and S-matrix Description of a Mach-Zehnder Modulator	**presentation**: 34th IEEE-SPIE Symposium: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments
[Rep37]	Malinowski M.	Modeling, elaboration and investigation of micro- and nano-photonic structures and characterization of new optically active materials	**scientific report** from the project granted by the Warsaw University of Technology
[Rep38]	Michalak B., Śmietana M., Koba M.	Silicon nitride overlays deposited on optical fibers with RF PECVD method for sensing applications: overlay uniformity aspects	**poster**: 9th Conference Integrated Optics – Sensors, Sensing Structures and Methods, IOS 2014
[Rep39]	Mroczkowski M., Kalenik J.	Study of constant electric field treatment influence on ZnS:Cu,Cl phosphors on degradation processes	**poster**: 38th International Conference of IMAPS-CPMT, IMAPS Poland 2014
[Rep40]	Mroczkowski M., Steplewski W., Futera K., Darakchiev R., Kozioł G.	New technologies of multi-layered printed circuit boards, intended of rapid-design electronic modules	**poster**: 38th International Conference of IMAPS-CPMT, IMAPS Poland 2014
[Rep41]	Mroczyński R.	Modi cation of properties of MOS test structures with high-K gate dielectric layer	**scientific report** from the project granted by the Warsaw University of Technology
[Rep42]	Mroczyński R.	TFT thin film structures with IGZO layers for transparent and exible electronics	**scientific report** from the project granted by the Warsaw University of Technology
[Rep43]	Mroczyński R., Szymańska M., Głuszewski W.	Reactive magnetron sputtered hafnium oxide (HfOx) layers for non-volatile semiconductor memory (NVSM) devices	**poster**: 18th Workshop on Dielectrics in Microelectronics, WoDiM 2014
[Rep44]	Myśliwiec M., Śmietana M., Mikulic P., Bock W.	Analysis of long-period gratings with plasma-deposited silicon nitride nano-overlays: experimental results and simulations	**poster**: 9th Conference Integrated Optics – Sensors, Sensing Structures and Methods, IOS 2014
[Rep45]	Parka J.	The study of nonlinear phenomena in a Mach-Zender modulator for microwave photonics systems and optimization of 3D imaging in the THz range realized in the re ectance system	**scientific report** from the project granted by the Warsaw University of Technology
[Rep46]	Pasternak I., Krajewska A., Jóźwik-Biała I., Ciuk T., Baranowski J., Strupiński W.	Synteza, właściwości oraz metody przenoszenia grafenu otrzymywanego na podłożach metalicznych metodą CVD	**poster**: XIII Krajowa Konferencja Elektroniki, KKE 2014

[Rep47]	Pfitzner A.	Integrated radio frequency voltage controlled oscillator design automation methods for submicrometer CMOS technologies	**scientific report** from the project granted by the Warsaw University of Technology
[Rep48]	Piramidowicz R.	High power fiber laser – an usable model	**scientific report** from the project granted by the Warsaw University of Technology
[Rep49]	Piramidowicz R., Stopiński S., Ławniczuk K., Jusza A., Anders K., Szczepański P., Leijtens X., Smit M.	Multi-wavelength transmitters in generic integration technology	**presentation**: 9th Conference Integrated Optics – Sensors, Sensing Structures and Methods, IOS 2014
[Rep50]	Pleskacz W.	Dual-mode blocks of the integrated circuit GALILEO and GPS signal receiver in nanometer CMOS technology for precise positioning of mobile objects	**scientific report** from the project granted by the National Centre for Research and Development
[Rep51]	Sanghwa Lee D., Jasiński J., Łukasiak L., Kim D., Hahm S., Lee J.	Extraction of selected electrophysical parameters of GaN-MISHEMTs	**presentation**: KNU-BME-WUT Joint Workshop on ICT
[Rep52]	Śmietana M.	Long-period grating structures for monitoring of deformation and defects in structural materials	**scientific report** from the project granted by Ministry of Science and Higher education
[Rep53]	Śmietana M.	New generation of non-volatile resistive memory based on transition metals oxides	**scientific report** from the project granted by the Warsaw University of Technology
[Rep54]	Śmietana M.	Optical fiber sensors with nano lms for examination of bioliquids	**scientific report** from the project granted by the National Centre for Research and Development
[Rep55]	Stopiński S.	Multi-channel WDM transceiver in an InP-based generic integration technology	**scientific report** from the project granted by the Warsaw University of Technology
[Rep56]	Stopiński S., Jusza A., Anders K., Osuch T., Szczepański P., Różanowski K., Lewandowski J., Piramidowicz R.	Photonic Integrated Circuit for interrogating FBG-based sensing network	**poster**: 9th Conference Integrated Optics – Sensors, Sensing Structures and Methods, IOS 2014
[Rep57]	Szmidt J.	Constructions, technology and materials for microsystem sensors techniques	**scientific report** from the project granted by the Warsaw University of Technology
[Rep58]	Szmidt J.	Technology of new generation of hydrogen and hydrogen compounds sensor for over normative conditions applications "DETEH"	**scientific report** from the project granted by European Union structural projects
[Rep59]	Szmidt J.	The influence of subsurface doping of silicon carbide (4H-SiC) by ion implantation on electrophysical properties of MOS structures fabricated by thermal oxidation	**scientific report** from the project granted by the National Science Centre
[Rep60]	Szydlik A., Piotrowski A., Stanaszek D., Liebert M., Anders K., Piramidowicz R.	Fiber coupled infrared detectors	**poster**: 15th Conference on Optical Fibers and Their Applications
[Rep61]	Szydlik A., Piotrowski A., Stanaszek D., Liebert M., Anders K., Piramidowicz R.	Fiber coupled mid-infrared detectors	**presentation**: 34th IEEE-SPIE Symposium: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments
[Rep62]	Szymańska M., Krogulski K., Mikulic P., Bock W., Śmietana M.	Bending sensitivity of diamond-like carbon nano-coated long-period gratings	**poster**: 9th Conference Integrated Optics – Sensors, Sensing Structures and Methods, IOS 2014
[Rep63]	Szymańska M., Mroczyński R., Świniarski M.	Wpływ gazu rozcieńczającego silan na właściwości azotku krzemu wytwarzanego metodą chemicznego osadzania z fazy lotnej (PECVD)	**poster**: XIII Krajowa Konferencja Elektroniki, KKE 2014
[Rep64]	Taube A., Kosiel K., Król K., Kamińska E., Guziewicz M., Krystyna G., Kruszka R., Piotrowska A.	Charakteryzacja struktur MOS Al_2O_3 i Al_2O_3/SiO_2 na podłożach 4H-SiC	**presentation**: XIII Krajowa Konferencja Elektroniki, KKE 2014
[Rep65]	Taube A., Kozubal M., Kaczmarski J., Barcz A., Wojtasiak W., Dyczewski J., Dynowska E., Borysiewicz M., Ekielski M., Juchniewicz M., Grochowski J., Prystawko P., Zając M., Kucharski R., Kamińska E., Piotrowska A.	Ion Implantation for Isolation of AlGaN/GaN HEMTs Using C or Al	**presentation**: International Workshop on Nitride Semiconductors 2014

10. CONFERENCES, SEMINARS AND MEETINGS

10.1. Conferences

NUMBER	CONFERENCE	PARTICIPANTS
[Con1]	4th National Conference on Nano- and Micromechanics, KKNM'14, Wrocław, Poland, July 08–10	Bieniek T., Domański K., Głuszko G., Janczyk G., Kociubiński A.
[Con2]	8th International Conference on Sensing Technology, ICST 2014, Liverpool, Great Britain, September 02–04	Śmietana M.
[Con3]	9th Conference Integrated Optics – Sensors, Sensing Structures and Methods, IOS'2014, Szczyrk, Poland, March 03–07	Anders K. (poster), Borecki M. (regular paper, poster), Jasiński J., Jusza A. (poster), Myśliwiec M. (poster), Piramidowicz R., Stopiński S. (3 posters, presentation), Szczepański P., Śmietana M. Chairman of Session: M.Borecki
[Con4]	15th Conference on Optical Fibers and Their Applications, Białystok – Lipowy Most, Poland January 29–February 1	Anders K. (poster), Borecki M. (poster), Jusza A. (poster), Kociubiński A., Kwitniewski N., Piramidowicz R., Sochacki M.
[Con5]	15th International Conference on Thermal, Mechanical and Multi-Physics Simulation and Experiments in Microelectronics and Microsystems, EuroSimE 2014, Ghent, Belgium, April 07–09	Kisiel R. (invited paper), Myśliwiec M. (poster)
[Con6]	16th Photonics North Conference, Photonics North 2014, Montréal, Canada, May 28–30	Śmietana M.
[Con7]	17th European Conference on Integrated Optics, ECIO 2014, Nice, France, June 24–27	Ławniczuk K., Stopiński S. (poster)
[Con8]	17th International Conference on Luminescence and Optical Spectroscopy of Condensed Matter, ICL 2014, Wrocław, Poland, July 13–18	Anders K. (poster), Boruc Z., Fetliński B., Jusza A. (poster), Kaczkan M., Malinowski M., Piramidowicz R.
[Con9]	17th International Symposium on Design and Diagnostics of Electronic Circuits and Systems, IEEE DDECS 2014, Warsaw, Poland, April 23–25 General Chair: Pleskacz W. Finance Chair: Trzaskowska K. Organizing Committee Chair: Kasprowicz D. Local Organizing Committee Members: Janczyk G., Łuczyk A., Narczyk P., Siwiec K., Staniewski M., Trzaskowska K., Wojtasik A. Programme Committee Member: Borejko T., Kasprowicz D., Kuźmicz W., Pleskacz W.	Kasprowicz D., Pleskacz W., Wielgus A. (poster) Session Chairman: Pleskacz W. (Keynote Presentation: Detection & Diagnostics in Today's Advanced Technology Nodes)
[Con10]	20th IMEKO TC-4 International Symposium Measurement of Electrical Quantities, Benevento, Italy, September 15–17	Śmietana M.
[Con11]	20th International Conference on Microwaves, Radar and Wireless Communications, MIKON 2014, Gdańsk, Poland, June 16–18	Madziar K. (presentation)
[Con12]	21st International Conference "Mixed Design of Integrated Circuits and Systems", MIXDES 2014, Lublin, Poland, June 19–21 Science Committee Member: Pfitzner A.	Mierzwiński P., Kopański J., Pfitzner A. (2 regular papers), Pleskacz W., Siwiec K., Staniewski M. Sessions Chairman: Pleskacz W. (Session–3 (Part 1): Analysis and Modelling of ICs and Microsystems; Session–5: Testing and Reliability; Session–7 (Part 2): Signal Processing); Pfitzner A. (Session–2: Design od the Integrated Circuits)
[Con13]	23rd International Conference on Optical Fiber Sensors, OFS'23, Santander (Cantabria), Spain, June 02–06	Śmietana M.

CONFERENCES

[Con14]	24th Anniversary World Congress on Biosensors, Biosensors 2014, Melbourne, Australia, May 27–30	Śmietana M.
[Con15]	28th European Conference on Solid-State Transducers, EUROSENSORS 2014, Brescia, Italy, September 07–10	Śmietana M.
[Con16]	34th IEEE-SPIE Symposium: Photonics Applications in Astronomy, Communications, Industry, and High-Energy Physics Experiments, Wilga Poland, 26 May–1 June	Anders K. (presentation), Borecki M. (two regular papers), Kalenik J. (presentation), Kociubiński A., Madziar K. (presentation), Piramidowicz R. (presentation), Chairman of Session: Borecki M.
[Con17]	38th International Conference of IMAPS-CPMT, IMAPS Poland 2014, Rzeszów-Czarna, Poland, September 21–24	Kalenik J. (poster), Kisiel R. (invited paper), Myśliwiec M. (invited paper, poster), Szczepański Z. Scientific Committee Member: Kisiel R.
[Con18]	39th International Conference. on Infrared, Millimeter and Terahertz Waves: IRMMW-THz 2014, Tucson, USA, September 14–19	Parka J.
[Con19]	Conference SPIE Photonics Europe 2014, SPIE PE 2014, Brussels, Belgium, April 14–17	Anders K. (presentation, poster), Jusza A. (poster), Stopiński S. (presentation)
[Con20]	Conference Urządzenia i Systemy Radioelektroniczne, Jachranka, Poland, October 28	Borejko T., Marcinek K., Siwiec K.
[Con21]	European Conference on Silicon Carbide & Related Materials ECSCRM 2014, Grenoble, France, September 21–25	Kwietniewski N., Król K., Sochacki M. (2 posters), Szmidt J.
[Con22]	IEEE International 3D Systems Integration Conference, 3DIC'14, Kinsale, Ireland, December 01–03	Borecki M. (poster)
[Con23]	IEEE International Conference On Oxide Materials For Electronic Engineering, OMEE-2014, Lviv, Ukraine, May 26–30	Malinowski M.
[Con24]	II Konferencja „Innowacyjne technologie wielofunkcyjnych materiałów i struktur dla nanoelektroniki, fotoniki, spintroniki i technik sensorowych" InTechFun, Warsaw, Poland, June 26–27	Myśliwiec M.
[Con25]	International Academic Conference on Education and E-learning, IAC-EeL 2014, Prague, Czech Republic, August 07–08	Baszun M.
[Con26]	International Conference AUTOMATION 2014, Warsaw, Poland, March 26–28	Ciuk T.
[Con27]	International Conference on Diamond and Carbon Materials, Madrid, Spain, September 7–11	Śmietana M.
[Con28]	IP-Embedded System Conference & Exhibition, IP-SOC 2014, Grenoble, France, November 05–06	Kuźmicz W., Piwowarska E.
[Con29]	Krajowa Konferencja Radiokomunikacji, Radiofonii i Telewizji, KKRRiT 2014, Warsaw, Poland, June 11–13	Borejko T.
[Con30]	Progress in Electromagnetics Research Symposium, PIERS 2014, Guangzhou (Canton), China, August 25–28	Śmietana M.
[Con31]	The European Nanoelectronics Forum 2014, Cannes, France, November 25–27	Pfitzner A.
[Con32]	The Fifth International Conference on Sensor Device Technologies and Applications, SENSORDEVICES 2014, Lisbon, Portugal, November 16–20	Borecki M. (regular paper) Technical Program Committee (science committee) Member: Borecki M.
[Con33]	X Konferencja Techniki Próżni, Cedzyna, Poland, September 22–25	Kalenik J. (poster)
[Con34]	XIII Krajowa Konferencja Elektroniki, KKE 2014, Darłówko Wschodnie, Poland, June 09–13	Sochacki M. (2 posters, presentation), Taube A. (presentation)

10.2. Schools, Seminars and Meetings

NUMBER	CONFERENCE	PARTICIPANTS
[Con35]	4th Plenary Meeting of CONNECT Advisory Forum, CAF, Brussel, Belgium, March 21	Łukasiak L.
[Con36]	16th International Krutyń Summer School – Lanthanide-based photonic materials and structures: breakthrough applications and cutting edge systems, Krutyń, Masurian Lake District, Poland, August 31–September 06	Jusza A. (poster), Piramidowicz R., Anders K (poster)
[Con37]	18th Workshop on Dielectrics in Microelectronics WoDiM 2014, Kinsale Co Cork, Ireland, June 9–11	Ber K., Majkusiak B., Mroczyński R., Tanous D.
[Con38]	19th International Hasselt Diamond Workshop on CVD diamond and other carbon materials SBDD XIX, Hasselt, Belgium, February 19–21	Śmietana M.
[Con39]	24th International Travelling Summer School on Microwaves and Lightwaves, ITSS 2014, Copenhagen/Lyngby, Denmark, July 05–11 Member of Organizing Committee: Madziar K.	Fetliński B. (presentation), Madziar K. (presentation), Malinowski M. (presentation), Parka J. (presentation)
[Con40]	37th International Spring Seminar on Electonics Technology, ISSE 2014, Dresden,Germany, May 07–11 Member of International Steering Committee and Technical Program Committee (TPC): R.Kisiel	Kisiel R. (poster), Myśliwiec M. (presentation)
[Con41]	CONSEPT Working Meeting, Nantes, France, November 23–26	Piramidowicz R.
[Con42]	EUPROMETA – 24th Doctoral School on Metamaterials: Metamaterials for microwave components and systems, Rome, Italy, March 24–27	Madziar K.
[Con43]	ICT Proposers' Day, Florence, Italy, October 09–10	Kuźmicz W., Pfitzner A.
[Con44]	IHP's 13th Workshop: High-Performance SiGe BiCMOS for Wireless & Broadband Communication and IHP Design Kit Tutorial 0.13μm BiCMOS, Frankfurt (Oder), Germany, October 15–17	Borejko T.
[Con45]	International Workshop on Nitride Semiconductors 2014, IWN 2014, Wrocław, Poland, August 24–29	Taube A.
[Con46]	Kick-off Meeting of Project: THIN but Great Silicon 2 Design Objects THINGS2DO, Grenoble, France, June 20	Piwowarska E.
[Con47]	KNU-BME-WUT Joint Workshop on ICT, Daegu, South Korea, October 22	Łukasiak L.
[Con48]	PARADIGM Review Meeting, Caswell, Great Britain, February 10–12	Szczepański P., Stopiński S.
[Con49]	PARADIGM Working Meeting, Eindhoven, Holland, September 08–10	Anders K, Szczepański P., Piramidowicz R.
[Con50]	PARADIGM Working Meeting, Goteborg, Sweden, June 03–04	Piramidowicz R., Stopiński S.
[Con51]	R&D funding opportunities on GNSS Receiver Technology Workshop, Bruxelles, Belgium, November 18	Borejko T.
[Con52]	The European Electromagnetic Materials Measurements and Applications Club, EMMA Club Meeting, London, Great Britain, May 22	Krupka J.
[Con53]	Ukrainian-Polish seminar "New Horizons of Liquid Crystals Science," Kiev, Ukraine, December 12	Parka J.
[Con54]	Working Meeting: EU Strategy for the Baltic Sea Region (EUSBSR)-Power electronic for Green Energy, Kista, Sweden , November 27–28	Sochacki M.

11. AWARDS

[Award1] Jerzy Domański, **President's of the Republic of Poland Gold Medal for Long-Term Service** (Medal Złoty za Długoletnią Służbę nadany przez Prezydenta Rzeczypospolitej Polskiej)

[Award2] Andrzej Jakubowski, **April 2, was given the title of Doctor Honoris Causa of Lodz University of Technology** (2 kwietnia 2014 r. nadano tytuł Doktora Honoris Causa Politechniki Łódzkiej)

[Award3] Krzysztof Madziar, **Award for distinguished paper – "Fiber Bragg Gratings Based Tuning of an Optoelectronic Oscillator" at International Conference on Microwaves, Radar and Wireless Communications – MIKON 2014**

[Award4] Bogdan Majkusiak, Lidia Łukasiak, Robert Mroczyński, Andrzej Mazurak, Agnieszka Zaręba, **WUT Rector's Collective Award for Organizing Achievements (1st stage)** (Nagroda Zespołowa I stopnia JM Rektora PW za działalność organizacyjną)

[Award5] Ryszard Piramidowicz, **WUT Rector's Individual Award for Scientific Achievements (2nd stage)**, (Nagroda Indywidualna II stopnia JM Rektora PW za działalność naukową – rozprawa habilitacyjna)

[Award6] Mateusz Śmietana, **WUT Rector's Individual Award for Scientific Achievements (1st stage)**, (Nagroda Indywidualna I stopnia JM Rektora PW za osiągnięcia naukowe w roku 2013)