ANNUAL REPORT

1. 1. 2001 - 31. 12. 2001

ESTABLISHED IN 1707

Department of Microelectronics
Faculty of Electrical Engineering
Czech Technical University in Prague
Czech Republic

CONTENTS:

Contact address:
Department of Microelectronics
Faculty of Electrical Engineering
Czech Technical University in Prague
Technická 2, 166 27 Praha 6, Czech Republic

Telephone: + 420 - 2 - 2435 2794
Telefax: + 420 - 2 - 2431 0792
E-mail: surname@fel.cvut.cz
www: http://www.micro.feld.cvut.cz/

Edited by Jan Vobecký (December 2001)

FOREWORD

The Department of Microelectronics belongs to The Faculty of Electrical Engineering (FEE) that is one of the five faculties forming the Czech Technical University in Prague (CTU in Prague). The roots of CTU in Prague can be followed as far back as the year 1705, when Christian Josef Willenberg (1655 - 1731) wrote a letter to Emperor Leopold I. in Vienna seeking permission to begin public teaching of engineering sciences. This was granted by a decree of Emperor Josef I (successor to Leopold I.) on 18 January 1707. For these reasons, the priority of CTU to be the first technical school at university level in the world is usually claimed for.

The Department of Microelectronics has been established in January 1977. During the past 24 years more than 1000 students graduated in the branch of Microelectronics and 30 Ph.D and 5 DrSc. degrees have been awarded. Five persons from the Department staff became professors and 14 Associate Professors. The Department offers the B.Sc., M.Sc. and Ph.D. degrees in Electronics.

The Department maintains international co-operation with many universities, research laboratories, and institutes in the Europe, namely in connection with the LEONARDO and SOCRATES Programmes, NEXUS, COPERNICUS and EUROPRACTICE projects and in the frame of the NATO Science for Peace programme. This year, activities of the Department within the Fifth Framework Programmes of the European Community were started, namely in the Programme Access to Research Infrastructure Improving the Human Potential.

The Department gives a high priority to collaborative research with industry, e.g. MOTOROLA, ST Microelectronics, Polovodiče a.s., TESLA Sezam a. s., etc.

This brochure is the 12th annual review of our Department. The contents of this report emphasise our effort for continuing the close association of teaching, research and co-operation with external subjects at both national and international levels.

Prague
December 2001

Jan Vobecký
Editor

STAFF OF THE DEPARTMENT

Head of the Department:	M. Husák, M.Sc., Ph.D.
Deputy:	J. Schrőfel, M. Sc., Ph.D., DrSc.

Professors:	M. Husák, M.Sc., Ph.D.
	J. Kodeš, M.Sc., Ph.D., DrSc.
	J. Vobecký, M.Sc., Ph.D., DrSc.
Associate Professors:	Z. Burian, M.Sc., Ph.D.
	J. Foit, M.Sc., Ph.D.
	P. Hazdra, MSc., Ph.D.
	J. Schrőfel, M.Sc., Ph.D., DrSc.
	M. Šemberová, M.Sc., Ph.D.
	V. Třeštíková, M.Sc., Ph.D.
	F. Vaníček, M.Sc., Ph.D.
	J. Voves, M.Sc., Ph.D.
Assistant Professors:	J. Jakovenko, M.Sc.
	L. Jirásek, M.Sc., Ph.D.
	M. Kirschner, M.Sc.
	A. Krejčiřík, M.Sc., Ph.D.
	Z. Rozehnal, M.Sc., Ph.D.
	V. Záhlava, M.Sc., Ph.D.
	L. Čopák, M.Sc.
	V. Janíček, M.Sc.
	J. Novák, M.Sc.
	P. Tesař, M.Sc.
Ph.D. students:	Z. Brychta, M.Sc.
	J. Burčík, M.Sc.
	P. Čapek, M.Sc.
	A. Mačkal, M.Sc.
	B. Palán, M.Sc.
	L. Polívka, M.Sc.
	V. Prazjler, M.Sc.
	M. Slunečko, M.Sc.
	P. Solařík, M.Sc.
	O. Starý, M.Sc.
	T. Váňa, M.Sc.
	J. Vít, M.Sc.

SUPPORT STAFF

Administration

R. Burianová
H. Kubátová

Teaching Laboratories:

L. Kafka

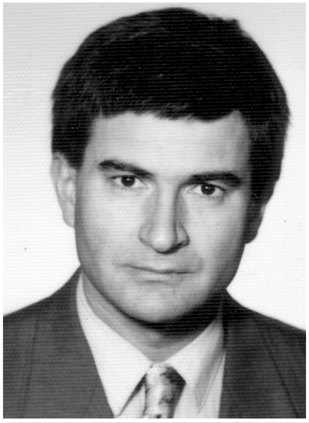
Technical Service:

M. Horník
P. Telinger, Mgr.

Military Service (duty to compensate):

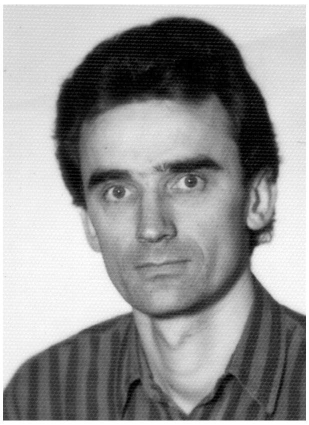
A. Doubek

ABOUT THE STAFF



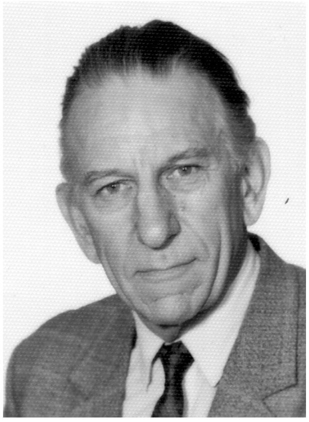
Miroslav Husák was born in 1953. He graduated in Radioengineering, FEE-CTU . Ph.D degree in 1985. 1978-1984 research fellow in the Department. Assistant Professor from 1984, Assoc. Professor from 1997, Full Professor from 2000. He is the author of 3 lecture notes, co-author of 1 exercise note and 100 technical papers. He is working in the field of sensors, sensor systems and microsystems. He is teaching the courses Sensor systems, Power Suppliers in electronics and Sensors in Security systems and Microsystems. Vice-President of IMAPS.

Jiří Kodeš was born in 1932. He received MSc., Ph.D., and D.Sc. degrees in electronics, semiconductor physics and microelectronics from the CTU in Prague in 1956, 1963 and 1990, resp. At present, he is Full Professor at the Department. His area of research includes electronic transport in semiconductors and quantum electronics devices. He is the author or co-author of numerous technical papers in journals and conference proceedings. He has written several textbooks for students.



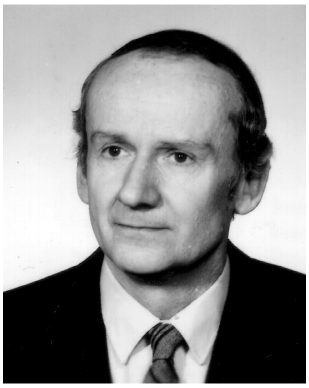
Jan Vobecký was born in 1957. He graduated in Electrotechnology from the FEE-CTU in 1981. PhD. degree in 1988, Assoc. Professor in 1992, DrSc. degree in 1999, Full Professor in 2000. In 1988, 1989/90, and 1993 visiting fellow in the University of Uppsala, and MOTOROLA Toulouse, resp. Author of numerous technical papers, 2 patents, one textbook and 8 printed lectures. He is teaching Electronics, TCAD and Modern power devices. Research in the field of power devices and ICs. Chairmen of the IEEE-EDS in the Czech Republic.

Zdeněk Burian was born in 1944. He graduated from the FEE-CTU in 1966. In 1975 he received PhD. degree. He is the author of 35 technical papers, 10 printed lectures and he owns 7 technical inventions. He is Assoc. Professor and gives lectures on optoelectronics. He is working in the field of integrated optics and planar optical waveguides. He researched the optical waveguides in silica in University of York, U.K.. Member of EOS and Czech Society of Photonics.



Julius Foit was born in 1932. He received MSc., PhD. and Ass. Prof. degrees in Radar Engineering, Colour TV Eng. and Multiphase Signal Processing from the CTU in Prague in 1954, 1961 and 1978, resp.. Dean of the Faculty in the University of Maiduguri, Nigeria in 1987-1989 and B. Tech. Programme Coordinator in the University of Zimbabwe, Harare, in 1990-1993. Currently, he is Associate Professor in the Dept. He is the author of many papers, several monographs and textbooks for students. He is a Fellow of ZIE and President-elect of Rotary Int.

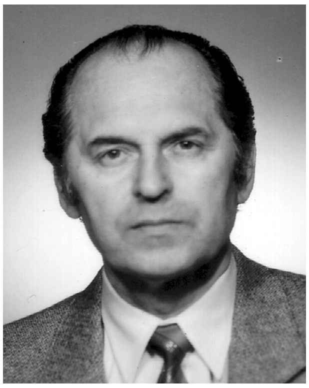
Pavel Hazdra was born in 1960. M.Sc. and Ph.D. in Microelectronics from FEE-CTU. In 1987 and 1996 he became Assistant and Assoc. Professor, resp. In 1988, 1992, and 1993 visiting fellow at the University of Surrey, Hull, and Lund, resp. Research on defects in semiconductors and characterization (DLTS, etc.). Manager of the Electron Device Group. More than 80 scientific and technical papers, 2 patents and printed lectures.



Josef Schrőfel was born in 1933. He graduated from FEE-CTU in Prague in 1956. PhD. degree from STU Bratislava in 1972, D.Sc. degree from CTU in Prague in 1994, and Assoc. Professorship in 1996. In 1974-1990 he was with Tesla Research Inst., Prague, working in research on electronic components, thin-films, solid state surface phenomena and semiconductors. Since 1975 his field is optoelectronics, optical fibres and integrated optics. He is the author of about 120 papers, 17 patents, 2 monographs and 3 books. Member of IEEE and EOS.

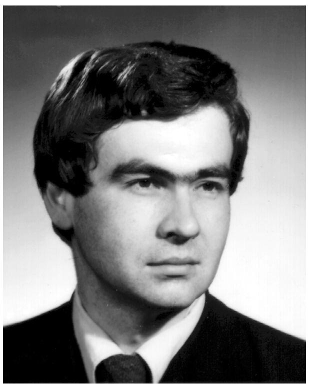
Miroslava Šemberová was born in 1939. She graduated in Radioelectronics from the FEE-CTU in Prague, in 1961. She received PhD. degree in 1973 and Associate Professorship in 1985. She is author of 12 technical papers and 10 printed lectures. She gave lectures in the area of electronic and microelectronic components. She was involved in research program concerning MOS integrated circuits and, at present, she is interested in sensors.

Vladimíra Třeštíková was born in 1943. She graduated in Automation technique from the FEE CTU in Prague, in 1965. She received PhD. degree in 1980 and became Associate Professor in 1985. She is presently teaching Electronic and Microelectronic Devices. She is the author of 5 printed lectures and 12 technical papers. She was involved in research program concerning MOS integrated circuit technology and, at present, she is interested in sensors.



František Vaníček was born in 1936. He graduated in Radioelectronics from the FEE-CTU in Prague, in 1960. PhD. in 1972 and Assoc. Professorship in 1978. From 1972 to 1975 he gave lectures in MTC Kahira, Egypt, and from 1981 to 1983 in HIE Beni Walid, Lybia. He is the author of 15 techn. papers and 10 printed lectures. He is teaching in the area of semiconductor structures and their models. The winter term of 1992 and 1993 he spent in KIHWV Ostende in the frame of TEMPUS programme.

Jan Voves was born in Prague in 1960. MSc. and RNDr. degree in Physical Electronics and Optics from the Charles' University in Prague in 1984. Since 1984, Research Assistant in the Department (characterisation of ion implanted doping profiles in semiconductors). From 1987 and 1996, Assistant and Assoc. Professor, resp. Ph.D in 1993. Research in the device physical modelling (Monte Carlo Method). Author of about 30 technical papers and 3 printed lectures. Member of the IEEE.

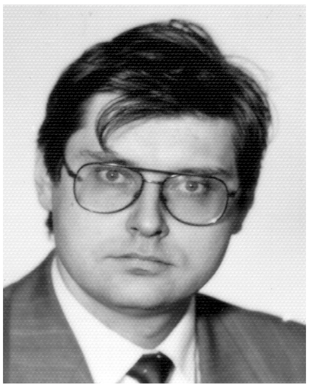


Lubor Jirásek was born in Prague in 1953. He graduated from the FEE CTU in Prague, in 1978. He received PhD. degree in Electronics in 1983. From 1978 to 1983 he was working as a Research Fellow in the area of high-power devices. He is author of 7 technical papers and 3 printed lectures. He is teaching in the area of semiconductor devices and solid-state physics. Presently, he is responsible for the curriculum of the Department.

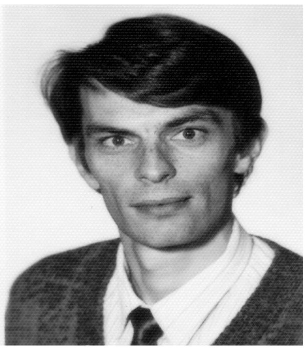
Jiří Jakovenko was born in Prague in 1972. He graduated in Microelectronics from FEE-CTU in Prague. He started his PhD. study with Microsystems group where he deals with the MEMS design and modeling. In 1998 he spent four months in Hogeschool Gent in the frame of TEMPUS programme. Since 1999 he is an Assistant Professor at the Department. He is teaching Electronics and IC Design. He is a member of the Academic Senate of the Faculty.

Michal Kirschner was born in Prague in 1960. He graduated from the FEE-CTU in Prague in 1984. He had been with TESLA Research Inst. for Telecommunications till 1991. There he worked in a laboratory for measurement of test structures for characterisation of CMOS ICs. Since 1991 he was an Assistant Professor at the Department teaching in the field of the IC design. In 2001 he joined Honeywell.

Alexandr Krejčiřík was born in 1947. He graduated in Electrotechnology from the Faculty of Electrical Engineering, CTU in Prague, in 1971. He received PhD. degree in Mathematics and Physics – branch Semiconductors. He is the author of 10 technical papers, 21 printed lectures and 6 textbooks. He is teaching courses on Electronics, Power supplies and Computer Peripherals.



Zdeněk Rozehnal was born in Prague in 1963. He graduated in Microelectronics from the Faculty of Electrical Engineering, CTU in Prague, in 1987. At present, he is working as an Assistant Professor. He is teaching electronics, microprocessors, single-chip microcomputers, PLDs and digital technique. He is the author of 20 technical papers, 3 printed lectures and holder of two certificates of technical invention.

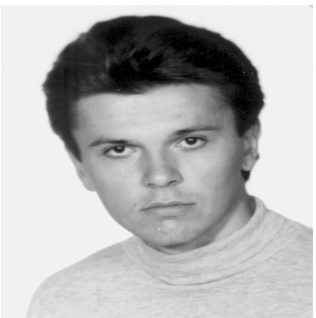


Vít Záhlava was born in Prague in 1965. He graduated in Microelectronics from the FEE-CTU in 1988. Ph.D. degree in 1994. He is teaching Electronics and PCB design. Active in EMC on PCB, design, application and testing. He is a member of the Academic Senate of the Faculty. He is the author of 3 textbooks, several printed lectures for students, and technical papers on power devices.

Libor Čopák was born in Jablonec nad Nisou in 1975. He graduated in Microelectronics from the FEE-CTU in Prague in 2000. He is working toward his PhD. He is a member of the Microsystems group. His activity is concentrated on the temperature fiber optic sensors.

Vladimír Janíček was born in 1974 in Most. He graduated in Microelectronics from the FEE-CTU in Prague. He is a member of Microsystems group. He is currently working towards his PhD. His research is in the field of optimization of charge process. At present, he takes part on a study stay abroad.

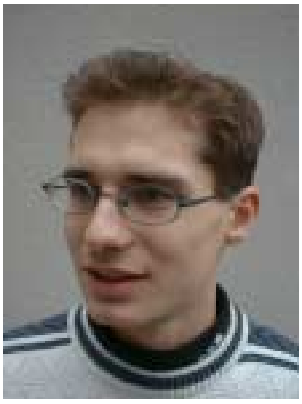
Jan Novák was born in Prague in 1973. In 1998, he graduated in Microelectronics from the FEE-CTU in Prague. He started his PhD. study with the Microsystems group where he deals with Electromagnetic compatibility of integrated circuits and microsystems. Since 2001 he is an Assistant Professor at the Department. He is teaching Electronics, PCB Design and IC Design.



Petr Tesař was born in Strakonice in 1971. He graduated in Microelectronics from the FEE-CTU in Prague, in 1994. The last two terms of his study he joined KIHWV, Oostende, Belgium, where he dealt with the design of On chip Iddq sensors for CMOS logical circuits (analog design). At present, he is part-time research fellow in the Department. He is a member of Microsystems group.

Zdeněk Brychta was born in Dačice in 1973. He graduated in Microelectronics from the FEE-CTU in Prague in 1999. He is working towards his Ph.D. He is member of the Optoelectronic group. His work is concentrated on the fabrication and diagnostics of optical planar elements.

Jaroslav Burčík was born in Havlíčkův Brod in 1973. He graduated in Microelectronics from the FEE-CTU in Prague, in 1998. He is working towards his Ph.D in the field of optoelectronics and optical networking. He is a member of the Optoelectronic group.

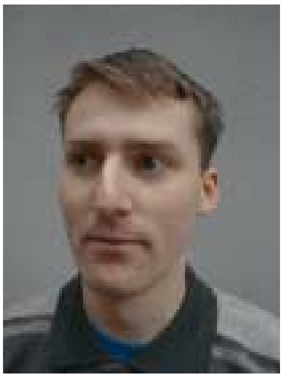


Pavel Čapek was born in Prague 13.3.1977. He graduated in Microelectronics from the FEE-CTU in Prague in 2001. He is working towards his Ph.D. in the field of active integrated optical waveguides. He is member of the Optoelectronics group.

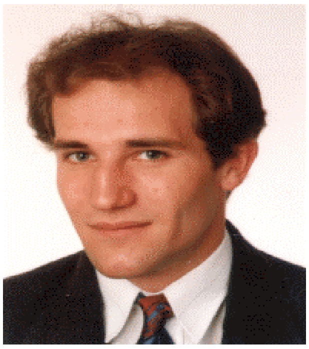
Adam Mačkal was born in Kaplice in 1976. He gradutaed in Microelectronics from the FEE CTU in Prague in 2001. In 1999-2001 visiting student at Bournemouth University. He is working towards his Ph.D. in Optoelectronics group. Member of IEEE and LEOS.

Bohuslav Palán was born in Pelhřimov, CZ, in 1973. He graduated in Microelectronics from the CTU in 1997. He joined TIMA Lab., Grenoble, France, (analog IC design of ISFET and pressure sensor interfaces - BARMINT ESPRIT III European project). His current research includes analog ASIC design, microsensors and microsystems for biomedical applications. Student member of Audio Engineering Society.

Leoš Polívka was born in 1974 in Semily. He graduated in Microelectronics from FEE-CTU in Prague in 1999. He is working towards his PhD. He is a member of the Optoelectronics group. His work is concentrated on the fabrication and measurement of optical waveguides on semiconductors substrates.



Václav Prajzler was born in Praha in 1976. He graduated in Microelectronics from the FEE-CTU in Prague, in 2001. He is working towards his Ph.D. He is member of the Optoelectronics group. His work is concentrated on the fabrication and diagnostics of optical passive and active planar waveguides.



Martin Slunečko was born in 1972 in Pacov. He graduated in 1997 in Electrotechnology from the FEE CTU, Prague. He is working towards his PhD. He is a member of the Optoelectronic group. His work is concentrated to the fabrication and diagnostics of optical planar elements.

Petr Solařík was born in 1973 in Kyjov. He graduated in Microelectronics from the FEE -CTU in Prague, in 2000 . At present he is PhD. student at the Department of Microelectronics. He is a member of the Optoelectronics group. He is working in the field of fiber optics sensors for applied spectrophotometry.

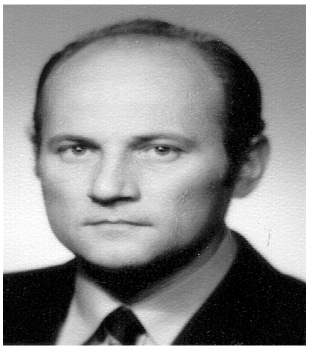
Ondřej Starý was born in Prague. He graduated in Telecommunications from the FEE-CTU in Prague in 1999. Since 2000, he is working towards his Ph.D. in the Department of Microelectronics. He is a member of the Microsystems group.

Tomáš Váňa was born in 1975 in Pardubice. He graduated in Microelectronics from the FEE-CTU in Prague in 2000. He is currently working as a PhD student in Microsystems group. His research is in the field of optoelectronics sensors and microsystems.

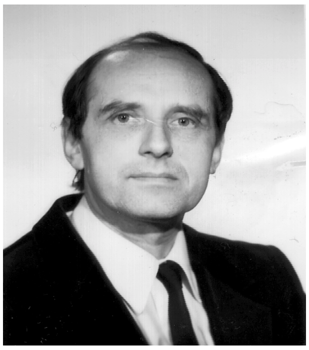
Josef Vít was born in 1974 in Třebíč. He graduated in Microelectronics from the FEE-CTU in Prague in 1999. He is currently working as a PhD student in the Electron Device Group. His research is in the field of bipolar power devices, lifetime engineering, and TCAD simulation of electron and ion irradiated power semiconductor devices.

Renáta Burianová was born in Prague in 1960. She graduated from grammar school in 1979 and Secondary school for librarians in 1981. She joined the Department of Microelectronics in September, 1981. From that time she has been in charge of administrative work of the Department.

Hana Kubátová was born in Český Brod in 1941. She graduated from Secondary Business school in 1958. She joined the Department of Microelectronics in 1977. Since that she has been in charge of organisational and administrative work of the Department, mainly as the Departments secretary.



Lubomír Kafka was born in 1943. He attended the grammar school from 1958 to 1961. From 1961 to 1963 he studied the secondary school on "Mechanic of electronic equipments". In 1965 he joined the CTU in Prague as a technician. At present, he is working as a technician in the Department. He is responsible for teaching laboratories. He is engaged in mechanical and electronic service.

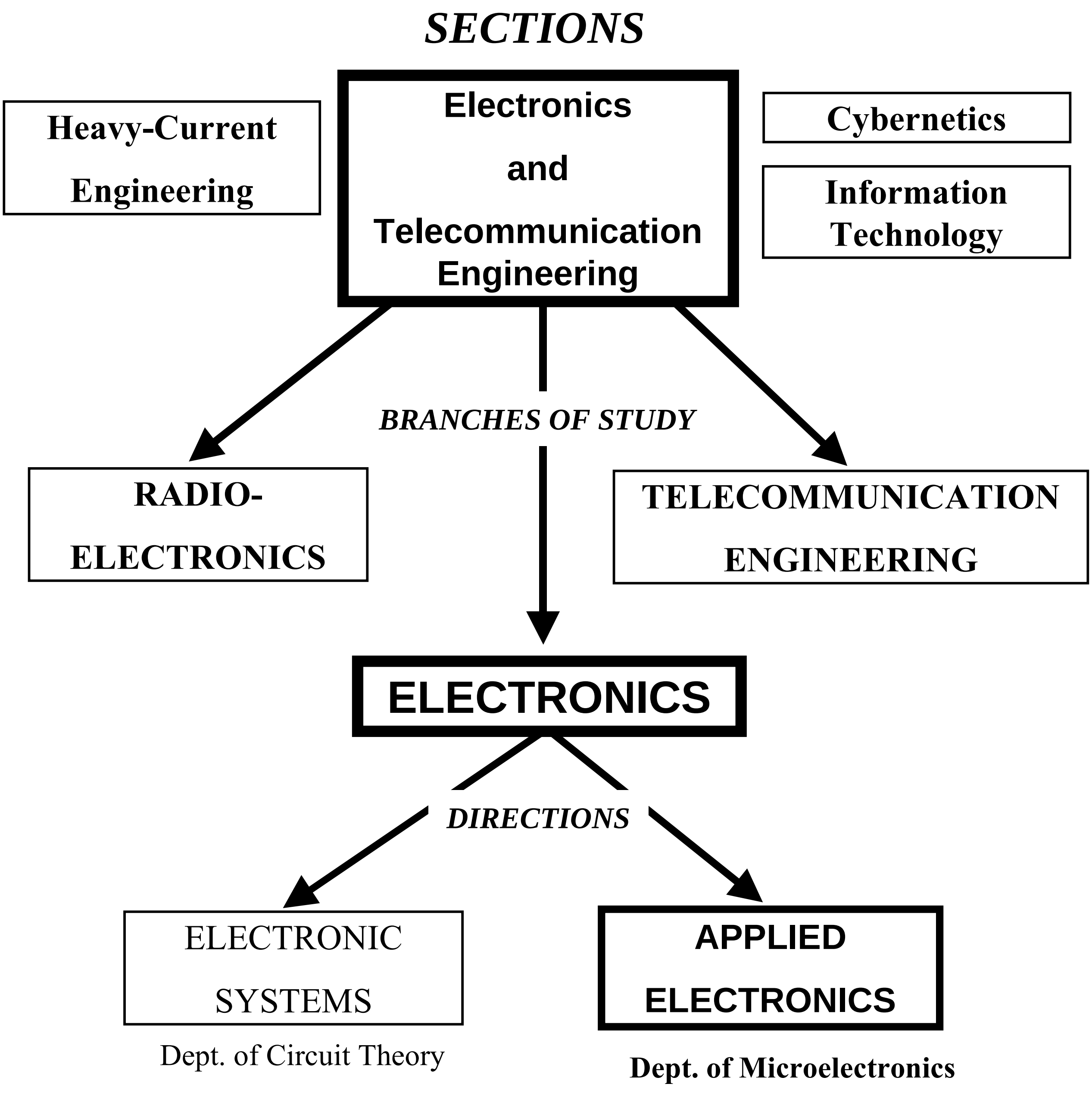


Miroslav Horník was born in Prague in 1946. He graduated in 1966 at a Secondary school specialized in Machinery engineering in Prague. He joined CTU Prague, then the Institute of Physics, Czechoslovak Academy of Science and, nowadays, he is working in the Department as a technician. He provides repair and service of miscellaneous tools and equipments.

Aleš Doubek was born in 1982 in Prague. In 2001 he graduated from Secondary School of Transport with specialisation on marketing and logistics in civil aviation. At present, he is a member of technical service of the Department in the frame of the civil military service.

UNDERGRADUATE TEACHING

Organization of study at the Faculty of Electrical Engineering



BRANCH OF STUDY ELECTRONICS

The objective of the electronic branch of study is to educate electrical engineers competent to solve problems concerning the wide spectrum of the structure of electrical industry and also extending to the field of information and computing technology, ecology, health care, mechanical engineering, robotics, etc..

The study involves the necessary theoretical introduction into subjects that provide general education for an electrical engineer which is followed by specialized courses. As to specialized orientation, the stress is laid on electronic components, semiconductor structures, digital and analog electronic circuits, microelectronics, application specific integrated circuit design, microcomputers, signals and electronic systems, sensors, design of electronic equipment, integrated and coherent optics, radiation sources and detectors, applications of optoelectronics and telecommunication systems.

The study of the applied electronics and electronic systems aims to prepare engineers who are able to solve problems of the applications of integrated circuits and of the special electronic structures and systems, as well as the electronic instrumentation design. The students master the digital signal processing methods and the implementation of algorithms in the special processor systems.

The optional subjects in the higher terms provide the students an opportunity of individual choice of their further specialisation emphasising the applications of electronics, electronic systems, optoelectronics and physical electronics.

The topics of lectures, laboratory and seminar exercises have been selected so that a student can master the reported stuff perfectly also in practice. The Department of Microelectronics endeavours to give the students, especially those with excellent results, the possibility of satisfying their professional ambition home, as well as abroad. The graduates are also offered a possibility of further postgraduate (Ph.D) studies. We believe that the graduates of our specialisation will find good jobs in industry of developed countries.

At present, a completely new curriculum is being designed and negotiated to replace the present one in two years.

CURRICULUM OF THE BRANCH ELECTRONICS

Obligatory and facultative subjects

(first two years of study):

Course name	Lectures and exercises in hours per week	Term
Obligatory subjects:		
Mathematics I	3 + 4	Winter
Introduction to Algebra	2 + 2	
Introd. to Computers Design and Programming I	3 + 2	
Physical Chemistry	2 + 1	
Introduction to Electrical Engineering	1 + 1	
Technical Documentation	2 + 2	Win/Sum
Economics	2 + 2	
Mathematics II	3 + 3	Summer
Mathematical Logic	2 + 1	
Introd. to Computers Design and Programming II	2 + 2	
Physics I	3 + 3	
Circuit Theory I	3 + 2	
Mathematics III	3 + 2	Winter
Physics II	4 + 3	
Circuit Theory II	3 + 2	
Material Technology for Electronics	2 + 1	
Electronics Microelectronics Dept.	2 + 2	
Electrical Measurements	3 + 3	
Mathematics IV	3 + 3	Summer
Electromagnetic Field Theory I	3 + 3	
Introduction to Computer Systems	2 + 2	
Facultative subjects:		
Basic Course on Power Electronics	3 + 2	Summer
Materials and Technology	3 + 2	

Obligatory and facultative subjects of the branch Electronics

Bachelor Study (beginning from the third year of a study (Microelectronics, Optoelectronics, Applied Electronics)

Course	Lectures and exercises in hours per week	Term
Obligatory subjects:		
Electron Devices Microelectronics Dept.	3 + 3	Winter
Electronic Circuits	4 + 2	
Mathematics V	2 + 2	
Electromagnetic Field and Waves	3 + 3	
Facultative subjects:		
Power Supply for Electronics Microel. Dept.	2 + 2	
CAD for High Frequency Techniques	2 + 2	
Analysis of Electronic Circuits	2 + 2	
Obligatory subjects:		
Basic Course on Digital Techniques	3 + 3	Summer
Linear Circuits and Systems	2 + 2	
Signals and Systems	4 + 2	
Facultative subjects:		
Microcomputers Microelectronics Dept.	2 + 2	
Circuit Tech. of Electronic Systems	2 + 2	
Antennas and Wave Propagation	2 + 2	
Obligatory subjects:		
Telecommunication Systems	3 + 3	Winter
Bachelor Project (only for st. ended as BSc.)	0 + 6	
Facultative subjects:	2 + 2	
Microelectronics Microelectronics Dept.	2 + 2	
Optoelectronics Microelectronics Dept.	2 + 2	
Sensor Systems Microelectronics Dept.	2 + 2	
Introd. to Digital Signal Processing	2 + 2	
Electrical Filters	2 + 2	
Application of Signal Processing for DSP	2 + 2	

MSc. COURSE
CURRICULUM OF THE BRANCH ELECTRONICS

Obligatory and facultative subjects (beginning from the fifth year of a study)

Course name		Lectures and exercises in hours per week	Term
Obligatory subjects:			
Mathematics VI		2 + 2	Winter
Digital signal processing		3 + 2	
Electronics of Semiconductors	Microelectron. Dept.	2 + 2	
Facultative subjects:			
Sensors in Security Systems	Microelectronics Dept.	2 + 2	
Design of Integrated Circuits	Microelectronics Dept.	2 + 2	
Architecture and Using of Programmable Circuits I		2 + 2	
Electronic Systems		2 + 2	
Obligatory subjects:			
Optoelectronics II	Microelectronics Dept.	3 + 2	Summer
Analogue and Digital Systems		3 + 2	
Semestral Project		0 + 4	
Facultative subjects:			
Practices on IC Design	Microelectronics Dept.	1 + 3	
Applications of Power Devices	Microelectronics Dept.	2 + 2	
Radiation Sources and Detectors		2 + 2	
Implementation of DSP		2 + 2	
Architecture and Using of Programmable Circuits II		2 + 2	
Obligatory subjects:			
Diploma Project	Microelectronics Dept.	0 +14	Winter
Practices in Laboratories of Electronics		0 + 4	
Facultative subjects:			
Design of Analogue and Digital Mixed Signal Systems		1 + 3	
Communications in Data Networks		2 + 2	
Satellite Communication and Navigation Systems		2 + 2	

FACULTATIVE SUBJECTS

Facultative subjects offered by the Dept. of Microelectronics for the whole Faculty are as follows:

Course name	Lectures and exercises in hours per week	Term
Microelectronics Department only		
Applicсation of Microelectronic Devices	2 + 2	Summer
Device Interconnection Techniques	3 + 1	S/W
PLD - Architecture and Application	2 + 2	Summer
Computer Interfaces	2 + 2	Summer

Facultative subjects offered by the Department of Microelectronics to Ph.D. Students of the whole Faculty:

Course name
Advanced Semiconductor Power Devices and Ics
Applications of TCAD Tools
Crystaloptics and Nonlinear Optics
Diagnostics and Testing in Microelectronics
IC Design
Integrated Optics
Microsystems
Optical Radiation Detection and Detectors
Programmable Logic Devices
Prospective Electronic Devices
Semiconductor Radiation Sources
Technology of Optoelectronic Structures
VLSI Structures and Technologies

A BRIEF DESCRIPTION OF COURSES GIVEN BY THE DEPARTMENT

Electronics, (Basic course)

Semiconductors, PN junction, diodes, bipolar transistors, unipolar transistors, power amplifiers, small signal amplifiers, switching circuits. Power amplifier classes. Multilayer switching devices. Op-Amps. Optoelectronics: sources and detectors. Thermistor, posistor, Hall sensors. Power triode, klystron, magnetron, TWT. Applications.

Electron Devices, BSc

Diodes, unipolar and bipolar transistors, switching, optoelectronic and passive components, vacuum tubes. Physical mechanisms, principles of device operation, properties, characteristics, parameters and models of devices. Basic circuits, recommended applications, switching operation. Noise parameters. Basic structures of integrated circuits. Computer modeling and experimental verification.

Power Supplies in Electronics, BSc

Rectifiers. Stabilisers - parametric, with continuous control. IC voltage regulators. Fly-back converter. Forward converter. Push-pull converter, double forward converter. Monolithic regulators. EMC. Over current protection. Over voltage, under voltage, output reverse voltage protection. Overload and thermal protection. Batteries, solar battery, accumulator, chargers. References.

Application of Microelectronic Devices, BSc

Parasitic parameters of Op. Amps. Suppression of DC and AC residual errors in Op. Amps. Power amplifiers, stabilizers, switch mode power supplies. Logic circuit families. Interference: signal, supply, external, switching. Timing errors, data refresh, grounding. Integrated signal coders and decoders, telecommunications devices, AD and DA converters. Requirements, tolerances, application directions.

Microcomputers, BSc

Motorola 68HC05 and 68HC11 families. I/O tasks, MCS-48, 8243 expander, programmable peripheral ICs. Development and debugging tools. Design and programming of instruments and systems based on single-chip computers. Individual students' projects.

Computer Interfaces, BSc

Architecture of computers oriented mainly on IBM PC platform (Microprocessors in PC, available chip sets, trends, suppliers). Hardware and software description oriented on different kinds of interfaces. PC interface standards, throughput and data flow. Protocols, basic boards in PC. Floppy Disc, Hard Disc interfaces. Serial interfaces: RS232C, RS422A, RS485. Parallel interfaces: CENTRONICS, IEEE488. Computer networks. Internet, e-mail, conferences, WWW.

Microelectronics, BSc

Basic functional structures of ICs. Passive and active elements. Technological process. Bipolar and unipolar structures. Logic integrated circuits, VLSI circuit systems. Analogue integrated circuits. Design of vertical structure, layout, design rules. System of IC process quality control. IC functional and parametric testing, test structures, yield and reliability.

Optoelectronics I, BSc

Basic principles of optoelectronics. Planar and fiber optical waveguides. Semiconductor lasers and LEDs. Semiconductor light detectors. Structures for distribution and harnessing of optical radiation. Optoelectronic processors. Optical communication systems. Optical amplifiers. Display devices. Optical memories. Optical fiber sensors. Integrated optical and photonic structures.

Sensor Systems, BSc

Sensor - classification, materials, production. General characteristics - static and dynamic parameters, errors, noise, linearisation, calibration. Microelectronic sensors materials, physical principles, design, integration. Temperature sensors, pressure sensors, SAW sensors, optoelectronic sensors, fibre optic sensors.

Radiation sensors. Magnetosensors. Chemical sensors, biosensors. Humidity sensors. Flow meters. Level sensors. Sensor signals processing. Smart sensors. Application of sensors.

Physics of Semiconductor Devices, MSc

Semiconductor crystal lattices, band structure of semiconductors, statistical distributions, charge transport, scattering mechanisms, non-equilibrium carrier densities, non-homogeneous semiconductor systems, heterostructures, physics of bipolar and unipolar devices, semiconductor sources and detectors of radiation, laser physics, low dimensional structures.

Design of Integrated Circuits, MSc

Importance of ICs. Economic aspects of IC. Design methodologies: gate arrays, standard cells and functional blocks, full custom design. Design hierarchy: behavioural description, logic and electric design, simulation, layout capture and verification. CAD tools for IC design: HDL, front end tools, simulators, layout editors, structural synthesis, silicon compilers. IC testing.

Sensors in Security Systems, MSc

Security, safety and multi-channel systems. Dynamic analysis and optimisation. Signal interference and system internal noise. Input quantities. Analog and digital signal processing, conversions. Signal representation and sensor signal code. System calibration. Communication in system, interface. Output unit - communication, indication, registration, protection, switch, local and remote control, actuators.

Optoelectronics II, MSc

Optocouplers. Sensors (spectral, amplitude, interferometric, polarimetric). Distributed fiber-optics sensors. Fiber-optics communications, components of the optical fiber link, modulation. Modulation, multiplexing and coupling. System performance. Receiver sensitivity. Coherent optical communications. Optical memories. Optical processors. Laser measuring system. Laser Doppler velocimetry. Spectral analyzers.

Application of Power Devices, MSc

Static and dynamic processes of power structures in forward, blocking and reverse mode of operation. Power diodes, BJTs, thyristors and special thyristor structures, field controlled power devices, HF and HV devices, power ICs, characteristics and features. Packaging and cooling, transient thermal impedance. Principles of application in power circuits, basic trigger and application circuits.

Radiation Sources and Detectors, MSc

Optical radiation Thermal sources, electroluminescent diode. Lasers active medium, optical resonators, gas, liquid, dye, solid-state and injection lasers, laser modes: mode controlled, frequency agility, spectral width, frequency stability, amplifiers, mode locked. Photomultipliers, photoresistors, photodiodes, nonselective detectors. Optical receivers, PIN and APD coupling, optical preamplifiers.

Practice of IC Design I, MSc

Main purpose of this course is to enable students to design their own integrated circuit. Students will work in groups (of 5 to 10 students) on the design project using industrial standard CAD tools (CADENCE, SYNOPSYS). Successful circuits could be fabricated via EUROPRACTICE project. The lectures will be concentrated in the first three weeks of the term and will be devoted to IC design methodologies, CAD tools, description of available libraries and design rules.

Advanced Semiconductor Technologies, MSc

Electrical characteristics of processed materials. Bulk crystal growth. Oxidation. Lithography. Doping. Etching. Chemical vapour deposition. Physical vapour deposition. Ion implantation. Packaging. VLSI Processes. Microsystems. Cleanliness and purity in the process environmental.

Applications of Modern Devices, MSc

Analog devices, optimisation. Interference of different types of signal transmission, optimisation. Rules for optimisation of large arrays, power distribution, interfacing. Mixed-mode devices. Diagnostics in ADC's and DAC's, minimising residual errors. Standards for interface buses, sensors, actuators, ergonomics. Processing of small and large signals, noise, insulation.

Design of Power Supplies, MSc.

This represents extension of the subject “Power Supplies in Electronics”. The main field comprises Integrated circuits for SMPS (principles, design, verification.) Coils, transformers, regulators, synchronous rectifiers, resonance power supplies.
Switcher CAD. Magnetic design Tool. Filter CAD. MicroPower Switcher CAD.

TCAD for Electronics I

Principles of Technology CAD. ATHENA technology simulator. Introduction to the ATLAS device simulator. Drift-diffusion approximation. Poisson and continuity equations. SRH model. Models of Auger, optical generation-recombination and surface recombination, impact ionisation and mobility. Heat flow equation. Boundary conditions. Boltzmann transport equation. Mathematical background of simulation techniques.

Device Interconnection Techniques

Computer design of printed circuit boards (PCB). System OrCAD. Design rules for PCB according to EMC in analog, digital and power applications. Supply and grounding techniques. Technological processes and fabrication of PCB, classes of accuracy. Surface mount technology and devices, circuit layout process and soldering. Technological and design trends. Design of student PCB by use of PC in departments computer room.

Programmable Logic Devices

Programmable logic devices (PLD): history and perspectives, principles of operation, overview of basic architectures and production technologies. Simple PLD (PAL, GAL, PLA), Complex PLD (EPLD and CPLD), Field Programmable Gate Arrays (FPGA) : internal architecture, device types, properties, design principles and development systems. PLD design: design procedure, hardware description languages (ABEL, VHDL), partitioning, design implementation. Design economy, comparison with other ASIC methodologies. Design of SPLD and CPLD using various development systems (Lattice – Synario, Xilinx – Foundation).

TCAD for Electronics II, MSc

Technology CAD. Application of ATHENA technology simulator and ATLAS device simulator. Drift-diffusion and hydrodynamic models. Models of recombination, impact ionisation and mobility. Simulation of optoelectronic and power devices. Heat flow equation. Boundary conditions. Boltzmann transport equation. Monte Carlo Method. Simulation of quantum coupled devices. Simulation techniques. Examples.

Design of CMOS and BiCMOS Circuits, MSc

Trends in CMOS and BiCMOS technologies. Parameters of basic structures. Modeling and simulation. Parasitic structures. Design rules, layout design. CMOS and BiCMOS logic gates. Standard CMOS and BiCMOS ICs families. CMOS and EECMOS memories. PLDs, FPGAs. Analogue CMOS and BiCMOS circuits. Switched-capacitor and switched-current techniques, MOST-C filters. Comparators, operational amplifiers, OTAs.

Applications of TCAD Tools, PhD

Fundamentals of TCAD. Technology, process, device and mixed device-circuit simulators. ATHENA, principles and application. ATLAS, principles and application. Semiconductor equations. Boundary conditions. Numerical methods. Models of recombination, impact ionisation, mobility. Practical exercises according to individual projects on SUN workstations.

Crystaloptics and Non-linear Optics, PhD

Optical medium type classification. Single- and double-axis optical anisotropy. Chiral media. Propagation of planar waves, polarisation, phase and group velocity vectors. Energy balance and reciprocity. Reflection and refraction. Electro-optical and piezoelectric tensors. Theory and design of beam handling devices.

Diagnostics and Testing in Microelectronics, PhD

Physical and electrical methods of measurement of material properties, operational structures and electronic devices. Test structures and test chips.

Functional and parameter testing of integrated circuits.

Programmable IC Design, PhD

IC reasons of integration, IC design methodologies and approaches. Application Specific Integrated Circuits (ASIC) and programmable devices. Principles, architecture, technologies and internal structure of Programmable Logical Devices (PLD), Complex Programmable Logical Devices (CPLD) and Field Programmable Gate Arrays (FPGA). Automatic design tools. Design using Hardware Description Languages (HDL): Abel, VHDL. Design methodology, optimization and partitioning.

Integrated Optics, PhD

Theoretical and technological principles of IO. Light propagation in dielectric waveguide structures. Methods of waveguide structures solution. Basic physical effects and interactions used for IO structures. Fabrication of dielectric waveguides and IO structures. Passive and dynamic waveguide devices. Non-linear devices. Semiconductor integrated optoelectronics.

Optical Radiation Detection and Detectors, PhD

Electromagnetic radiation spectrum. Radiometric and photometric units. Detection of optical radiation. Ideal detector, internal and external photo-effect. Optical receivers, design principles, properties. Noise. Detectors based on external or internal photo-effect, on thermal phenomena and others. Solar cells, properties.

Advanced Electron Devices, PhD

Energy band engineering, quantum well, wire, point. 2-D electron gas devices (HEMT, MOD FET) and double-barrier resonance tunneling (RDTB, RHET) as memories, generators, multipliers etc. Heterostructures, microwave and cryotronic devices. Recording media.

Advanced Power Semiconductor Devices and ICs, PhD

Physical and technological principles of advanced power devices. Trends of evolution. Parameters and applications of advanced devices. Bipolar structures. MOS structures. BiMOS structures. PN diodes. Schottky diodes. BJT transistors. DMOS and IGBT transistors. Thyristors, including GTO and MCT. Secondary breakdown theory and design rules. Smart-power devices. High voltage devices, applications.

Semiconductor Radiation Sources, PhD

Stimulated emission in semiconductors, Homogeneous junction and heterojunction. Double heterostructure lasers. Waveguide resonators, DFB structures. Types and properties of lasers. Bistable and memory devices, switches. Non-coherent LEDs. Super-LEDs. Laser injection amplifiers. Applications and measurement of various types.

Technology of Optoelectronic Structures, PhD

Preparation of optoelectronic materials and structures, diagnostic and testing methods. Fabrication of semiconductor waveguides, LEDs, lasers, photodetectors and QW structures. Design and fabrication of planar dielectric waveguide structures for distribution and harnessing of optical radiation. Measuring and testing methods. Properties of various structures, practical examples.

VLSI Structures and Technologies, PhD

Functional structures of integrated circuits, unipolar and BiMOS structures. 3D structures, submicron technologies. Problems associated with dimensional reduction. Memory cells. Test structures. VLSI processes. New technologies. IC design, layout, design rules. Reliability and yield. Limitations in ICs.

Electrical Transport in Semiconductors, PhD

Electrons and holes in semiconductor crystals. Boltzmann transport equation, scattering. High field transport. Quantum transport, resonant tunneling. Single electron transport, Coulomb blockade. Ballistic transport. Transport in magnetic field, quantum Hall effect.

RESEARCH ACTIVITIES

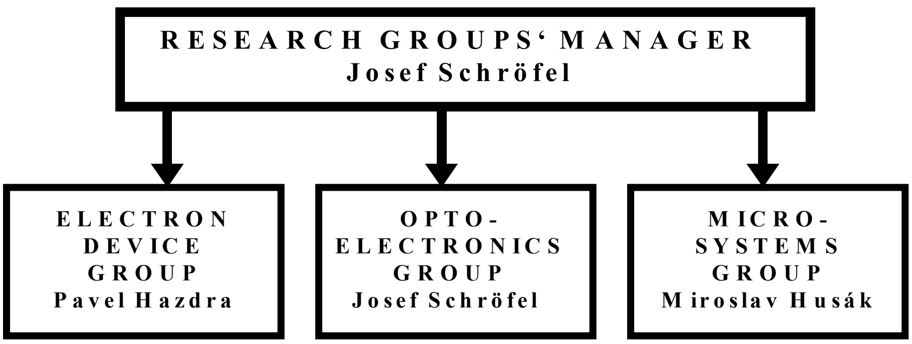
The Department has continued in research activities through grants and contracts from the Ministry of Education of the Czech Republic, Grant Agency of the Czech Republic, and CTU in Prague. A significant part of research activities was supported by the Programmes of the Ministry of Education in the following fields:

- Energy Quality and Savings,
- Environmental Research,
- Information and Communication Technology,
- Laser Systems and their Applications,
- New Measuring Methods of Physical Quantities,
- Reasoning and Control in Production,
- Trans-Disciplinary Biomedical Engineering Research.

The international projects were those of the NATO Science for Peace Programme and the 5th Framework Programme of the European Community, Access to Research Infrastructure Improving the Human Potential.

In the field of research contracts, co-operation with foreign institutes and companies has continued, namely with Motorola, Transportation Systems Group and ST Microelectronics.

The research activities of the Department are focused on Electron Devices, Optoelectronics and Microsystems as listed below in the order of their date of origin. These three directions constitute an organisation scheme of the research in our Department and are schematically shown below. This scheme is supplemented by a brief summary of activities of individual research groups and list of their members. This is followed by description of relevant research projects of individual research groups. The list of contracts is given as well.



ELECTRON DEVICE GROUP

Head of the Research Group: P. Hazdra
Members: J. Vobecký, J. Voves, Z. Rozehnal, V. Záhlava, J. Kodeš, J. Vít

Research Activities:

- Quantum Devices and Nanostructures
- Device and Process Simulation
- Lifetime and Defect Engineering
- Ion Irradiation
- Power Devices and Integrated Circuits
- Current Injection Capability of Microcontroller Units
- Programmable Logic Devices

OPTOELECTRONICS GROUP

Head of the research Group: J. Schrőfel
Members: Z. Burian, M. Slunečko, J. Burčík, L. Polívka, Z. Brychta, V. Prajzler, A. Mačkal, P. Čapek, V. Drahoš

Research Activities:

- Preparing and Testing of Planar Waveguides Based on Various Deposition and Diffusion Techniques
- Analysing, Preparing and Testing of Novel Planar Electro-Optic Structures for Distribution and Harnessing of Optical Radiation
- Research toward the Integrated Optic Circuits for Measuring and Sensor Applications

MICROSYSTEMS GROUP

Head of the Research Group: M. Husák
Members: J. Jakovenko, L. Jirásek, M. Kirschner, F. Vaníček, B. Palán, P. Tesař, L. Čopák, V. Janíček, O. Starý, T. Váňa, J. Foit, J. Novák

Research Activities:

- Semiconductor Microsystem Structures
- Sensor Signals Processing and Wireless Transmission
- Sensor Control Systems
- Biomedical, Temperature, Pressure Sensors, and Flowmeters

RESEARCH PROJECTS

ELECTRON DEVICE GROUP

APPLICATION OF HIGH-VOLTAGE CURRENT TRANSIENT SPECTROSCOPY FOR CHARACTERIZATION OF DEFECT DISTRIBUTION IN MeV PROTON IRRADIATED SILICON

P. Hazdra, K. Brand* and **J. Vobecký**
*Dynamitron-Tandem-Laboratorium, Ruhr-Universität Bochum, D-44780, Bochum, Germany

Current transient spectroscopy (CTS) using high relaxation voltages up to 1 kV is shown to be an effective tool for non-destructive characterization of radiation defect profiles in silicon resulting from the MeV ion irradiation. The method was used for profiling of different defect centers produced in low-doped, float zone, n-type silicon by irradiation with 3, 4, and 5.3 MeV protons to a fluence of $5x10^9$ and $1x10^{10}$ cm^{-2}. The results were compared with those received from capacitance DLTS and reverse I-V profiling. Electronic properties and introduction rates of dominant defect centers were also established. It is shown that CTS is capable to trace full-depth profiles of dominant radiation defects and provide precise and more accurate data than those previously presented by destructive profiling procedures. Measured distributions of vacancy-related radiation defects agree well with the distribution of the primary damage received from Monte Carlo simulations with the exception of the peak broadening attributed to vacancy diffusion.

OPTIMUM LIFETIME STRUCTURING IN SILICON POWER DIODES BY MEANS OF VARIOUS IRRADIATION TECHNIQUES

P. Hazdra, J. Vobecký and K. Brand*
*Dynamitron-Tandem-Laboratorium, Ruhr-Universität Bochum, D-44780, Bochum, Germany

Contemporary trends in development of fast recovery silicon power diodes necessitate complex and accurate structuring of excess carrier lifetime. During last decade, Local Lifetime Control by light ion (proton and alpha-particle) irradiation combined with Uniform Lifetime Reduction by irradiation with MeV electrons became an essential tool for production of modern custom-specific silicon power devices which replaced traditional methods of lifetime killing based on recombination centers introduced by noble metal (gold, platinum) diffusion.

In our project, the application of radiation defects introduced by different particles was investigated in that way to fulfil increasing demands on increasing switching speed, higher blocking voltages and *di/dt* capability of power P^+PNN^+ diodes. Local lifetime control by proton and alpha-particle irradiation with energies 1.8 - 12.1 MeV and doses $2x10^{10}$ - $5x10^{12}$ cm^{-2} was compared with uniform lifetime killing by 4.5 MeV electrons with doses up to $2.5x10^{15}$ cm^{-2}. The influence of both the techniques on static and dynamic parameters of modified diodes was experimentally established and explained by means of state-of-the-art simulation system Results show that degradation of blocking characteristics represents a key problem of local lifetime control while inability to properly structure carrier lifetime is the main disadvantage of electron irradiation. It is shown that optimal axial lifetime structuring giving superior recovery characteristics is achieved by well-balanced combination of two local lifetime treatments either by protons or alphas.

CHARACTERIZATION OF LASERS WITH δ-InAs LAYER IN GaAs

P. Hazdra , J. Voves , J. Oswald*, E. Hulicius*, J. Pangrác*, K. Melichar*, O. Petříček*, T. Šimeček* and K. Kuldová*
*Institute of Physics, Academy of Sciences, Cukrovarnická 10, 162 53 Prague 6

Electroluminescence and photocurrent spectroscopy of lasers with different numbers (1, 3, 5, 7) of δ InAs layers in GaAs prepared by Metal-Organic Vapor Phase Epitaxy was investigated in the broad temperature range from 10 to 400 K. The dependence of the electroluminescence spectra on the number of δ-InAs layers and on the distance of δ InAs layers was studied under pulse excitation in the wide range of current densities. Results show that by increasing the number of δ InAs layers and decreasing the distance between δ InAs layers it is possible to decrease the lasing emission energy below 1.15 eV and shift the maximum of laser emission efficiency to higher temperatures. Our δ InAs lasers are able to operate at temperatures over 100°C, they exhibit weak temperature dependence of threshold current density with values lower than 0.2 $kAcm^{-2}$ and their differential quantum efficiency lies between 12 - 18 %.

CROSSING POINT CURRENT OF ELECTRON, PROTON AND HELIUM IRRADIATED POWER DIODES

J. Vobecký, P. Hazdra, V. Záhlava

Project support: Polovodiče a.s.

Contemporary power modules comprise parallel connected active and passive semiconductor components in which a homogeneous distribution of current is a serious problem. This is because in surge conditions, there are large values of peak current and voltage together with the increase of die temperature that may lead to thermal destruction. This can be eliminated in a device with positive temperature coefficient of the forward voltage drop (PTC). However, a bipolar device always possesses negative temperature coefficient (NTC) at low currents which can switch to PTC at certain current level called crossing point current I_{Xing}. As it is desirable to design devices with low I_{Xing}, this project was started with aims to investigate the I_{Xing} level in dependence of electron and proton irradiation doses and energies. This year, the study was extended to helium irradiated diodes. The devices under consideration are the soft recovery ones (2.5kV/100A) from Polovodiče a.s.

IMPACT OF LIFETIME CONTROL ON THE REVERSE RECOVERY OF HIGH-POWER P-i-N DIODE

J. Vít, J. Vobecký, P. Hazdra

Project support: Research Programme No. JE MSM 212300017
Grant CTU No.300109113

Increasing switching frequency of power circuits puts continuous demand on increased *dJ/dt* and *dV/dt* capability of silicon P-i-N power diode. Fast turn-off process can result in device failure, where dynamic avalanche with subsequent avalanche injection is generally recognized as the starting mechanism. Appearance of the dynamic avalanche primarily depends on the ON-state excess carrier spatial distribution. To extend the safe operation area (SOA) an appropriate shaping of the spatial distribution of these carriers can be realized using particle or combined electron-particle irradiation. At the same time, a special care should be taken at the junction termination. The aim of this project is to study the details of the dynamic avalanche in the mode of resistive switching reverse recovery. The diodes are subject to high dose electron irradiation at the bevel area and surroundings to exclude influence of the bevel and to achieve. Single shot dynamic avalanche capability is studied along with current filamentation using the device simulation.

HELIUM IRRADIATED HIGH-POWER P-I-N DIODE WITH PtSi ANODE CONTACT

J. Vobecký, P. Hazdra, V. Záhlava, J. Vít

Project support: CTU grant No. 300109213

The dynamic parameters of the state-of-the-art high-power devices are usually optimized using electron, proton or helium irradiation. A major drawback of these methods is that the improvement of dynamic parameters is paid by worsening the static parameters. One of the static parameters is the ON-state voltage that increases with electron irradiation dose and proton and alpha particle irradiation dose and energy. In this project the traditional anode aluminum metallization was replaced with PtSi layer of lower specific resistance. This way the ON-state voltage reduction at 20% was achieved for 2.5kV/100A diode. That amount covers the increase caused by ion irradiation into the anode area with energy and dose of practicle importance. As a result, the trade-off between the ON-state and turn-off losses is significantly improved.

IGBT LIFETIME KILLING PROCESS USING SIMULATION TOOLS

J. Vobecký, P. Hazdra, J. Vít, X. Jorda*, P. Godignon*, M. Vellvehi*, J. Rebollo*, M. Badila**

*CNM Barcelona, Spain, ** IMT Bucharest, Romania

Project support: European Community MicroServ Project No.HPRI-CT-1999-00107, CTUP MicroServ Project Reference: 14

The goal of the project consists in the design of ion irradiation experiments for localised IGBT lifetime reduction using device simulation tools. The works are performed on a well-known IGBT structure and the comparison between simulation and experimental results provides information about simulation limitations, data for calibration of relevant model parameters, and validation of the previously established irradiation design procedure. A specific run of 600V - 25mm^2 vertical PT - IGBTs was fabricated at CNM, Barcelona. CTU in Prague performs all the simulation works. The processed wafers will be sent to accelerator facilities in Forschungszentrum Rossendorf, Germany, to be irradiated with protons considering the predicted irradiation parameters. After irradiation, the wafers will be characterised in terms of radiation defects and electro-thermal behaviour. This characterisation will include static I-V curves and dynamic switching tests at different voltage, current and temperature levels in order to identify the main electrical parameters and their corresponding variations and dispersions. Reliability of the final devices will also be studied, with special attention on the aspects related with irradiation process.

SAFE ARITHMETIC FOR COMPACT PLC

Z. ROZEHNAL

Compact Programmable Logic Controllers (PLC) are used in the wide range of the control and regulation applications. They are mostly used for the autonomous regulation functions or for the local data saving systems. The high level independence of the compact PLC on the main control requires high quality of control software. Beside its basic control or regulation function the control software checks operational and unexpected system errors. The requirement for implementation of self-correction functions in the control PLC software is implicated from described reasons and safe arithmetic is used for this problem solution.

OPTOELECTRONICS GROUP

OPTICAL WAWEGUIDE STRUCTURES BASED ON ION - EXCHANGE IN GLASS SUBSTRATES

J. Schröfel, J. Špirková -Hradilová [*], J. Čtyroký[**], P. Nekvindová [*], P. Nebolová [*], J. Denk[*], **V. Drahoš**
[*] Dept. of Inorganic Chemistry, ICT
[**] Inst. of Radio Eng. and Electronics, Academy of Sciences, Czech Republic
Project support: Grant Agency of the Czech Republic No. 102/99/1391

Planar and channel waveguide structures fabricated by ion-exchange in glass could be potentially utilised in large variety of components for distribution and harnessing of optical radiation. The research work deals with study of preparation and properties of single and multimode planar waveguides based on pure thermal or field-assisted exchange of K^+-Na^+, Li^+-Na^+ and Cu^+-Na^+ ions. The research has continued in fabrication of single mode channel waveguides and verification of their application in distributive and sensor structures.

OPTICAL WAVEGUIDE STRUCTURES BASED ON APE IN $LiNbO_3$

J. Špirková -Hradilová *, **J. Schröfel**, J. Čtyroký**, P. Nekvindová[*] **, Z. Burian, Z. Brychta, P. Čapek,** P. Nebolová[*], **A. Mačkal, V. Drahoš**
*Dept. of Inorganic Chemistry, ICT
**Inst. of Radio Eng. and Electronics, Academy of Sciences Czech Republic

Project support: Grant Agency of the Czech Republic, No. 102/99/1391

Annealed proton exchange (APE) provides a perspective alternative for fabrication of high quality single mode channel waveguides in lithium niobate. The last experimental works are concerned on explanation of the relations between lithium and hydrogen subsurface distribution and refractive index profile and properties of the waveguides. The research has continued in verification of possible application of prepared waveguides in optical modulators and sensors.

FABRICATION AND PROPERTIES OF ACTIVE PLANAR WAVEGUIDES IN GLASS AND LITHIUM NIOBATE SUBSTRATES

J. Schröfel, J. Spirková -Hradilová *, **Z. Burian**, J. Čtyroký**, **M. Slunečko**, P. Nekvindová[*], **Z. Brychta,** P. Nebolová[*]
*Dept. of Inorganic Chemistry, ICT

** Inst. of Radio Eng. and Electronics, Academy of Sciences, Czech Republic

Project support: Grant Agency of Czech Republic, No. 102/99/1391

Active channel waveguides in lithium niobate and glass substrates are perspective candidates for planar optical amplifiers for optical communications. Our research starts with experimental study of doping of lithium niobate and glass substrate with Er^{3+} ions and will continue in fabrication of waveguides in erbium-doped substrates. The very important task of the research is study of relations between properties of the substrates, technological conditions waveguides fabrication and properties of the fabricated waveguides. Last but not least, the necessary measurements methods, for example for absorption or luminescence properties, are to be developed.

RESEARCH OF OPTICAL WAVEGUIDE GaAs/GaAlAs STRUCTURES

J. Schröfel, Z. Burian, J. Burčík, J. Čtyroký*, M. Brožíček**, **L. Polívka**, **P. Čapek**, **A. Mačkala**
* Inst. of Radio Eng. and Electronics, Academy of Sciences, Czech Republic
** Inst. of Physics, Academy of Sciences, Czech republic
Project support: Grant Agency of the Czech Republic, No.102/99/0414

The aim of the project is to fabricate and investigate waveguide structures for wavelength 1.00 - 1.55 micrometers based on various types of semiconductors. Main method of fabrication of the test structures is metalorganic chemical vapour deposition. At present time, the structures based on GaAs/GaAlAs system have been studied. Very important task of the research is to design suitable methods of measurements. The research will continue by verification of possible applications of prepared waveguides in optical sensors

OPTICAL WAVEGUIDES ON SILICON SUBSTRATE

Z. Burian, I. Hüttel***, J. Schröfel, Z. Brychta,** J. Čtyroký**, **V. Prajzler**
* Department of Solid-State Engineering, ICT, Prague
** Inst. of Radio Eng. and Electronics, Academy of Sciences, Czech Republic
Project support: Grant Agency of the Czech Republic, No.102/00/0895

The aim of the project is to fabricate and investigate carbon and carbon nitride planar waveguides on silicon substrates. Planar waveguides are created by a carbon or carbon nitride layer which is deposited in PECVD apparatus on layer of silicon oxide providing optical shielding of the substrate and is prepared by the oxidation of silicon wafer. The present works are concentrated on determining of suitable conditions of technological process and on measuring of waveguides properties. We have proved that is in principle possible to dope the deposited layers by erbium ions so that resulting structures can be used as the active waveguides as well.

DESIGN OF A FIBRE SENSOR WITH LIQUID CORE FOR TRACE CHEMICAL ANALYSIS

Z. Burian, P. Solařík

Project support: CTU Research Programme DN MSM 212300016

The project treats the development and design of optofibre sensor with liquid core for trace chemical analysis. The project is directed to design multimode waveguide with liquid core for spectro-photometric measurements. The project is related to the previous work, where the literature was studied and the method of the sensor design was chosen. The sensor was modelled, simulated and the most suitable technology and materials were searched for.

DESIGN OF OPTICAL FIBRE SENSORS FOR THE WASTE WATER AND THE ENVIRONMENT MONITORING

Z. Burian, P. Solařík

Project support: CTU Research Programme DN MSM 212300016

The project treats the development and design of chemical optical fibre sensors with evanescent wave for waste water and environment monitoring. The goal is to develop and design chemical sensors especially for the purpose of monomode fibre waveguides with evanescent wave. The project is related to the previous work, where the literature was studied and the method of the sensor design was chosen. The sensor was modeled, simulated and the most suitable technology and materials were searched.

MICROSYSTEMS GROUP

ELECTROMAGNETIC COMPATIBILITY IN MICROSYSTEM DESIGN

J. Foit, J. Novák

Project support: Grant Agency of the Czech Republic, No. 102/00/0939

In the year 2001, the measurements regarding crosstalks in PC boards were finished. All measurement results were in excellent agreement with the results of the suggested simulation procedures, they were generally more accurate than the results of common simulation methods used up till now. The principal points of the work, i.e. the suggested simulation models, procedures and results of experimental verifications were published. Further work will be done in the future, aiming to EMC solutions in systems of considerably smaller dimensions, first of all inside the encapsulations of miniaturized systems as integrated circuits, microsensors and the like. The theoretical works for simulations of parasitic couplings in such systems, especially regarding the differences from macroscopic cases, are close to finish. The work planned for the next year or so will be devoted to experimental verifications of the theoretical results, provided that the necessary instrumentation can be secured (in part obtained already).

ELEDTRO-THERMAL SIMULATION OF GaAs POWER SENSOR MICROSYSTEM

J. Jakovenko, M. Husák

Project support: NATO SfP Project No.: SfP-974172

In this work we report on the thermo-mechanical simulations performed in the aim of optimising the temperature distribution of microwave power sensor microsystem. By means of thermal simulations we propose a GaAs cantilever beam design and layout of the HFET heater and temperature sensor placed on micro machined cantilever beam. Spatial temperature dependences, thermal time constant and power-temperature dependencies at different ambient atmospheres are calculated from the heat distribution. The 3D thermal and thermo-mechanical simulations of the sensor structures are performed using Memcad and CoweentorWare from Microcosm Technologies.

A TEMPERATURE SENSOR FOR NOISY MICRO-WAVE ENVIRONMENT

M. Husák, L. Čopák

Project support: Grant CTU No. CTU300108913

This project aims to design a fibre optic sensor of temperature. The usage of this sensor is advantageous for its good immunity against electromagnetic interference. The principle of the fiber optic sensor is based on the absorption edge shift with temperature. The work completes the modeling, simulation, material testing and technology optimization.

POWER SUPPLY FOR MICROSYSTEMS
M. Husák, V. Janíček
Project support: Grant Agency of the Czech Republic, No.102/00/0939

This project solves the problem of power supplies for implanted microsystems without a physical contact to outer world. Today, there are two modules solutions consisting of microsystem with sensor and the external power supply block. Today's common solutions of power supplies are very voluminous and can't be implanted with the microsystem. Therefore, there is an idea to integrate the power supply into a microsystem. There are in principle two attractive approaches, namely the rechargeable batteries and super capacitors. The aim is to propose a self-powered microsystem.

INTEGRATED INTELLIGENT BIOMICROSYSTEM WITH pH, PRESSURE AND TEMPERATURE SENSOR AND WIRELESS COMMUNICATION SYSTEM
B. Palán, M. Husák
Project support: Grant Agency of the Czech Republic, No. 102/00/0939

The basic building blocks of the system are the pH sensors (ISFET type), pressure and temperature sensors, analog interface with the possibility of autocalibrating and set-up function, A/D converter for conversion of the measured data to digital signal, controlling and communication block for measured data transmission and microsystem control. The project solves some partial problems, e.g. integration of microsensors and electronic circuits, A/D conversion, autocalibrating solution of analogue interfaces, integration of external wireless high frequency communication at frequencies 20-200 MHz.

INTEGRATED WIRELESS COMMUNIACTION SYSTEM FOR BIOMICROSYSTEM
M. Husák, J. Jakovenko, V. Janíček, J. Novák
Project support: Grant Agency of the Czech Republic, No. 102/00/0939

The aim is to design and realize prototypes of a rf receiver/transmitter on Si Chip, in the range 20-200 MHz, definition of the communication protocol, encapsulation and testing of the integrated microsystem. Design, testing, design of one-chip inductor for input circuits of the receiver.

INTELLIGENT INTEGRATED MICROSENSOR FOR UV RADIATION FOR BIOMICROSYSTEM

L. Jirásek

Project support: Grant Agency of the Czech Republic, No. 102/00/0939
CTU Research Programme JD MSM 210000012

Development of UV radiation microsensor suitable for integration into biomicrosystem. It is supposed to develop microsensors for UV radiation of a few types: microsensor for detection in all UVA, UVB and UVC regions, microsensors for UVA region, UVB region and UVC region, physiological microsensor simulating skin sensitivity to dangerous UV radiation, spectral sensitive microsensor for detection of radiation of different wavelengths.

INTERFACE DESIGN FOR A NEW TYPE OF AN ISFET SENSOR

B. Palán, M. Husák

Project support: Grant Agency of the Czech Republic, No.102/00/0939
CTU Research Programme JD MSM 210000012

The design has been done in co-operation with IMEC Leuven in Belgium where the technology of organic polymer based ISFET sensors was developed. With respect to low output currents (in the order of nA with the sensitivity about 30 nA/pH) and low-power low-noise interface, this sensor can be used for continuous monitoring.

REALISATION AND EXPERIMENTAL VERIFICATION OF PRODUCTION OF CHEMICAL ISFET SENSORS IN 0.6 μm CMOS TECHNOLOGY

B. Palán, M. Husák

Project support: Grant Agency of the Czech Republic, No.102/00/0939

Considerable effort has been exerted towards development of a fully integrated single-chip ISFET micro-system for pH measurements. A few N-type and P-type channel structures were fabricated in standard CMOS technology and tested. One of the N-ISFET structures with oxonitride passivation as ion-selective layer exhibits sensitivity about 25mV/pH.

ON-CHIP REFERENCE ELECTRODE FOR BIO-MEDICAL MEASUREMENTS

B. Palán, Husák, M.

Project support: Grant Agency of the Czech Republic, grant No.102/00/0939
CTU Research Programme JD MSM 210000012

The objective is to find a simple, easy to make reference electrode for bio-medical measurements. Production of a tiny reference electrode for an ISFET sensor which is a basic part of a micro-system for ”in vivo” measurements, is still a problem. The functionality of the reference electrode determines the precession of the ISFET. One of the applications is measurement of blood gases during hyperventilation in patients with respiration diseases.

RESEARCH GRANTS AND CONTRACTS

- The Temperature Sensor for Medical Use in Environments with Microwave Radiation
  Grant Agency of the CTU in Prague, Project No. 300108913
  Project Manager: **L. Čopák**

- Microsystems Centre
  Project of the Ministry of Education, Youth and Sports of the Czech Republic.
  Project no. VS 97046
  Project Manager: **M. Husák**

- Integrated Intelligent Microsensors and Microsystems
  Project of the Grant Agency of the Czech Republic.
  Grant no. 102/00/0939
  Project Manager: **M. Husák**

- Microwave Monolithic Integrated Transmitted Power Sensors and Their Industrial and Metrology Applications.
  Grant EU NATO Science for Peace Programme, no. SfP-974172
  Project Manager: T. Lalinský (Slovak Academy of Science, Institute of Electrical Engineering, Bratislava, Dept. of Microelectronics: **M. Husák)**

- Trans-Disciplinary Biomedical Engineering Research.
  Research Programme no. JD MSM 210000012
  Project Manager: Konvičková (Faculty of Mechanical Engineering, CTU)
  (Dept. Of Microelectronics: **M. Husák**)

- Research of New Methods for Physical Quantities Measurement and Their Application in Instrumentation.
  Research Programme no. JB MSM 210000015
  Project Manager: V. Haasz (Faculty of Electrical Engineering CTU in Prague)
  (Dept. Of Microelectronics: **M. Husák**)

- Formation and Monitoring of Environment.
  Research Programme no. DN MSM 212300016
  Project Manager: R. Bálek (Faculty of Electrical Engineering CTU in Prague)
  (Dept. Of Microelectronics: **M. Husák**)

- Characterization of Macrocells in BCD Process
  ST Microelectronics, Munich
  Project Manager: **M. Husák**

- Reasoning and Control in Production
  Research Programme no. JD MSM 212300013
  Project Manager: V. Mařík (Faculty of Electrical Engineering CTU in Prague)
  (Dept. Of Microelectronics: **Z. Rozehnal**)

- Modeling of Microelectromechanical Sructure of the Microwave Power Sensor
  Grant Agency of the CTU in Prague, Project No. CTU300109013
  Project Manager: **J. Jakovenko**

- New Technologies for Fabrication of Dielectric Waveguide Lasers and Amplifiers
  Grant Agency of Czech Republic, Grant No. 102/99/1391
  Project manager: **J. Schrőfel**

- MOVPE Prepared Materials and Structures for Electronic and Optoelectronic Devices
  Grant Agency of Czech Republic, Grant No. 102/99/0414
  Project manager: E. Hulicius, Czech Academy of Sciences, Prague
  (Dept. of Microelectronics: **J. Schrőfel**)

- Methodical Centre for Photonic Waveguide Structures,
  Grant Agency of Czech Republic, Grant No. 102/99/M057
  Project manager: J. Čtyroký, Institute of Radio Engineering and Electronics, Academy of Sciences of the Czech Republic
  (Dept. of Microelectronics: **J. Schrőfel**)

- Information Technologies, Research Project of the Ministry of Education of the Czech Republic
  Research Programme no. JW MSM 213200014
  Project manager: J. Vejražka (Dept. of Radioelectronics, FEE-CTU)
  (Dept. of Microelectronics: **J. Schrőfel**)

- Laser Systems and their Applications
  Project of the Ministry of Education, no. JA MSM 210000022
  Project manager: J. Vrbová (Faculty of Nuclear Science, CTU in Prague)
  (Dept. of Microelectronics: **J. Schrőfel**)

- New Technologies for Passive and Active Planar Structures Based on Carbon and Carbon Nitride for Integrated Optics,
  Grant Agency of Czech Republic, Project no.102/00/0895
  Project Manager: I. Huttel (Institute of Chemical Technology, Prague)
  (Dept. of Microelectronic : **J. Schrőfel**)

- A Study of Dynamic Avalanche
  Grant Agency of the CTU in Prague, Project No. 300109113
  Project Manager: **J. Vít**

- IGBT Lifetime Killing Process Design Using Simualtion Tools
  European Community MicroServ Project No.HPRI-CT-1999-00107
  CTUP MicroServ Project Reference No. 14
  Project Manager: X. Jorda, (CNM Barcelona, Spain)
  Project Manager: **J. Vobecký (**Dept. of Microelectronics)

- New Methods of Local Lifetime Control
  Grant Agency of the CTU in Prague, Project No. 300109213
  Project Manager: **J. Vobecký**

- Energy Quality and Energy Savings
  Research Programme no. JE MSM 212300017
  Project Manager: J. Tůma (Dept. of Electronergetics, FEE-CTU)
  (Dept. of Microelectronics: **J. Vobecký**)

- Current Injection Capability Investigation of Microcontroller Units
  MOTOROLA Transportation System Group, Munich, East Kilbride
  Project manager: **J. Vobecký**

- Design and Simulation of MBE Grown Structures,
  Institute of Physics, Academy of Sciences, Czech Republic
  Project Manager: **J. Voves**

EDUCATIONAL GRANTS AND CONTRACTS

- Higher Education
  SOCRATES Programme 1999/2000, 2000/2001.
  (Dept. of Microelectronics: **M. Husák**)

- Foreign Training in the Area of Electronic System Design
  LEONARDO DA VINCI Programme 2001- 2003
  (Dept. of Microelectronics: **M. Husák**)

PUBLICATIONS

BOOKS
(IN CZECH)

A. Krejčiřík, „Switchmode Power Supplies with TopSwitch Circuits“, 1st Edition, *BEN - Technical Literature*, Prague, 2001

A. Krejčiřík, Z. Burian, „.Simulate!“, 1st Edition, *BEN - Technical Literature*, Prague, 2001

Z. Rozehnal, „Microcontrollers MOTOROLA HC11, 1st Edition, *BEN - Technical Literature*, Prague, 2001

J. Vobecký, V. Záhlava, „Electronics - Devices and Circuits, Principles and Examples“, *Grada Publishing*, 2nd Extended Edition, Prague, 2001

REFEREED JOURNALS
(IN ENGLISH)

P. Hazdra, K. Brand, J. Rubeš, **J. Vobecký**, Local lifetime control by light ion irradiation: impact on blocking capability of power P-i-N diode, *Microelectronics Journal*, 32, pp. 449 – 456, 2001

P. Hazdra, **J. Vobecký**, K. Brand, Optimum lifetime structuring in silicon power diodes by means of various irradiation techniques, *Nuclear Instruments and Methods in Physics Research B*, 186, pp. 414 - 418, 2001

J. Špirková-Hradilová, P. Nekvindová, J. Vacík, J. Červená and **J. Schröfel,** "Possibility of Tailoring n_e vs. c_{Li} Relations in Lithium Niobate Optical Waveguides", Optical Materials 15, pp. 269 - 278, 2001

P. Nekvindová, J. Špirková-Hradilová**, J. Schröfel** and V. Peřina, "Erbium Doping into Lithium Niobate and Sapphire Single Crystal Wafers", Journal of Material Research 16, pp. 333 - 335, 2001

P. Nekvindová, J. Špirková, J. Vacík, J. Červená, V. Peřina and **J. Schröfel**, "Importance of Crystal Structure of the Substrate for Diffusion Technologies of Waveguides Fabrication", International Journal of Inorganic Matearials 3, pp. 1245 - 1247, 2001

J. Dostálek, J. Čtyroký, J. Homola, E. Brynda, M. Skalský, P. Nekvindová, J. Špirková, J. Škvor and **J. Schröfel**, "Surface Plasmons Resonance Biosensor Based on Integrated Optical Waveguide", Sensors and Actuators, B76, pp. 8 - 12, 2001

REFEREED JOURNALS (IN CZECH)

J. Novák, J. Foit, "Parasitic Electromagnetic Couplings in PCB", Sdělovací technika, 49, pp. 12 – 15, 2001

M. Jirásková, **L. Jirásek,** „Protection Against the Effects of Solar and Artificial Radiation", Pracovní lékařství, 53, pp.19 – 23, 2001

M. Jirásková, **L. Jirásek,** J. Štork, „Therapy of Pruritus in Haemodialized Patients by UV Radiation", Časopis lékařů českých, 140, pp.173 – 177, 2001

INVITED LECTURES (ABROAD)

P. Hazdra, „Application of High Energy Ion Beams for Local Lifetime Control in Silicon Power Devices", *Forschungszentrum Rossendorf, Dresden*„ March 3, 2001

J. Vobecký, „Lifetime Control in Power Devices", *Lehrstuhl fur Technische Elektrophysik*, *TU Munich*, *Munich*, January 21, 2001

INVITED LECTURES (DOMESTIC)

J. Schröfel, „Active Optical Waveguides Based on Glass and Lithium Niobate", *Laser Systems Workshop*, CTU in Prague, Faculty of Nuclear Science and Physical Engineering, Prague, 2001

J. Vobecký, „Trends in Electron Devices and Integrated Circuits", *2nd Seminar Perspectives of Electronics*, SPŠE Rožnov pod Radhoštěm, 2001

CONFERENCES WITH PUBLISHED PROCEEDINGS (ABROAD)

P. Hazdra, **J. Vobecký**, K. Brand, „Optimum Lifetime Structuring in Silicon Power Diodes by Means of Various Irradiation Techniques“, *European Materials Society 2001 Spring Meeting, Symposion B – Defect Engineering of Advanced Semiconductor Devices*, Strasbourg, p. B-22., 2001

P. Hazdra, K. Brand, **J. Vobecký**, "Effect of Defects Produced by MeV H and He Ion Implantation on Characteristics of Power Silicon P-i-N Diodes", *2000 International Conference on Ion Implantation Technology Proceedings*, Alpbach, pp. 135 - 138, 2001

J. Oswald, E. Hulicius, J. Pangrác, K. Melichar, T. Šimeček, O. Petříček, K. Kuldová, **P. Hazdra**, **J. Voves**, Lasers with δ-InAs layer in GaAs, *European Materials Society 2001 Spring Meeting, Symposion I – Self Organization in Semiconductors: Fundamentals and Applications*, Strasbourg, p. I-9, 2001

M. Husák, „Student Education in Microsystems“, *Proceedings of The International MEMS Workshop 2001*, National University of Singapore, Singapore, pp. 549 - 558, 2001

M. Husák, „Pressure Microsensor for Wireless Measurement“, *Proceedings of The International MEMS Workshop 2001*, National University of Singapore, Singapore, pp. 633 - 642, 2001

M. Husák, J. Jakovenko, „Model of Temperature Microsystem with Wireless Communication, *Advances in Signal Processing and Computer Technologies*, WSES Press, pp. 417 - 420, 2001

M. Husák, J. Jakovenko, Model of Temperature Microsystem with Wireless Communication“, *Proceedings of the 5th International Conference on Circuits, Systems, Communications and Computers CSCC 2001*, Rethymno, pp. 6871 - 6874, 2001

M. Husák, J. Jakovenko, „Sensor System with Wireless Data Communication“, *Proceedings of Conference on Information Technology: Coding and Computing (ITCC'2001),* Las Vegas, pp.115 - 119, 2001

M. Huja, **M. Husák**, „Thermal Microactuators for Optical Purpose“, *Proceedings of Conference on Information Technology: Coding and Computing*

(ITCC'2001), Las Vegas, pp.137 - 142, 2001

J. Jakovenko, M. Husák, „MEMCAD Thermal Simulation of GaAs Based Membrane Bridge", *Proceedings of 12th Micromechanics Europe Workshop (MME'01)*, Cork, pp. 225 - 228, 2001

J. Novák, J. Foit, "Parasitic Electromagnetic Couplings in PC boards", *Proceedings of the ECS '01 Conference*, Bratislava, pp. 165 – 168, 2001

P. Simandl, **Z. Burian**, "Simulation of Image Sensor Design and Other Parallel Signal Processing Structures Using Pictures as an Input and Output", *Advances in Signal Processing and Computer Technologies*, WSES Press, pp. 72-75, 2001

C. Bartic, **B. Palán**, A, Campitelli, S. Borghs, „A Simple pH Detector Based on an Organic Field-Effect Transistor", *EUROSENSORS XV & TRANSDUCERS'01 Conference*, Munich, pp.1250 - 1253, 2001

Z. Rozehnal, „Safe Arithmetic for Compact PLC", *ECS'01 Conference Proceedings*, Bratislava, pp. 81-86, 2001

J. Schröfel, J. Špirková and I. Hüttel, „Optimization of the $Li^+ \leftrightarrow Na^+$ Ion Exchanged Optical Waveguides in Na_2O Rich Glas Substrates", *Book of Abstracts of the Conference MADICA 2001 (Conf. Les Materiaux Et Leurs Applications Aux Dispositifs Capteurs), Hammamet*, p. 94, 2001

J. Špirková, P. Nekvindová, J. Vacík, J., Červená, V. Peřina, A. Macková, **J. Schröfel,** M. Budnar, A. Razpet, B. Zorko P. Pelicon „Crystal Cut Dependent H^+ and Er^{3+} Doping into Lithium Niobate and Sapphire", *Proceedings of SPIE, Integrated Optics Devices V*, 4277, pp. 200 – 209, 2001

J. Špirková, P. Nekvindová, J. Vacík, J. Červená, V. Peřina, A. Macková, **J. Schröfel,** M. Budnar, A. Razpet, B. Zorko and P. Pelicon, „Crystal Cut Dependent H^+ and Er^{3+} Doping into Lithium Niobate and Sapphire", *Technical Summary Digest Conference Optoelectronics 2001, Integrated Optics Devices*, San Jose, p.8, 2001

J. Schröfel, J. Špirková, I. Hüttel and **Z. Burian**, „Low-loss Optical Waveguides Fabricated by Li^+ for Na^+ Ion Exchange in Na_2O Rich Substrates", *Proceedings of SPIE, Integrated Optics Devices V*, 4277, pp. 359 – 366, 2001

J. Schröfel, J. Špirková, I. Hüttel and **Z. Burian**: „Low-Loss Optical Waveguides Fabricated by Li^+ for Na^+ Ion Exchange in Na_2O Rich Substrates", *Technical Summary Digest Confonference on Optoelectronics 2001, Integrated Optics Devices V*, San Jose, p. 13, 2001

P. Hříbek, **M. Slunečko** and **J. Schröfel,** „Planar and Channel Optical Waveguide Loss Measurement Using Optical Phase Conjugation in BaTiO3“, *Proc. of SPIE*, *Integrated Optics Devices V*, 4277, pp. 336 – 341, 2001

Hüttel, P. Nekvindová, J. **Schröfel,** F. Černý, J. Gurovič, V. Prajzler and A. Macková „Thin Carbon and Carbon Nitride Films for Passive and Active Optical Waveguides“, *Proceedings of SPIE*, *Combinatorial and Composition Spread Techniques in Materials and Devices Development II*, 4281, pp.114 - 121, 2001

I. Hüttel, P. Nekvindová, **J. Schröfel,** F. Černý, J. Gurovič and V. Prajzler, „Passive and Active Carbon and Carbon Nitride Optical Waveguides“, *Book of Abstracts of the Conference MADICA 2001 (Conf. Les Materiaux Et Leurs Applications Aux Dispositifs Capteurs)*, Hammamet, p. 93, 2001

J. Špirková, P. Nekvindová, J. Červená, A. Macková, V. Peřina and **J. Schröfel,** „Crystal Cut Dependent Transport of Lithium in Annealed Proton Exchanged Lithium Niobate Waveguides“, *Proceedings of the Fifth International Conference on Materials Chemistry*, Bangor, p. 30, 2001

P.Nekvindová, J. Špirková, J. Červená, V. Peřina, A. Macková, T. Reichrt and **J**. **Schröfel**: „Annealed Proton Exchanged Optical Waveguides in r:$LiNbO_3$ and (Yb+Er):$LiNbO_3$“, *Book of Abstracts of the Conference MADICA 2001 (Conf. Les Materiaux Et Leurs Applications Aux Dispositifs Capteurs*, Hammamet, p.86, 2001

J. Špirková, P. Nekvindová, J. Červená, V. Peřina, A. Macková, **J. Schröfel,** M. Budnar, A. Razpet, B. Zorko and P. Pelicon: „APE:$LiNbO_3$ and Er^{3+} $LiNbO_3$ Crystal Cut dependent properties“, *Proceedings of the Fourth Annual Meeting of the COST Action P2, Applications of Nonlinear Optical Phenomena and Workshop on $LiNbO_3$*, Budapest, p. I-10, 2001

CONFERENCES WITH PUBLISHED PROCEEDINGS (DOMESTIC - IN ENGLISH)

P. Hazdra, **J. Voves**, E. Hulicius, J. Oswald, V. Záhlava, J. Pangrác, T. Šimeček: InAs/GaAs Lasers for Optical Communication : Preparation and Properties, *Proceedings of Workshop 2001*, Vol.5, Prague, pp. 366-367, 2001

J. Jakovenko, M. Husák, „Thermo-Mechanical Simulation of GaAs Power Sensor Microsystem“, *Book of Extended Abstracts, 5th Int. Student Conference on Electrical Engineering - Poster 2001*, *Prague*, pp.EE10, 2001

J. Vít, J. Vobecký, P. Hazdra, „The Dynamic Avalanche under Resistive Switching Reverse Recovery“, *Proceedings of the EDS´01 Conference*, Brno, pp.143 – 146, 2001

J. Vít, „Study of Current Filamentation in Power Diodes“, *Book of Extended Abstracts, 5th Int. Student Conference on Electrical Engineering - Poster 2001*, Prague, pp.EE24, 2001

J. Vobecký, **J. Vít**, **P. Hazdra**, Current Filamentation under Resistive Switching Reverse Recovery, *Electronic Devices and Systems 01 – Proceedings*, Brno, pp.139-142, 2001

J. Vobecký, P. Hazdra,, V. Záhlava, J. Vít, „Study of Power Diodes for Higher Reliability and Energy Savings“, *Proceedings of Workshop 2001*, Prague, Vol.5, Part A, pp. 336 – 337, 2001

CONFERENCES WITH PUBLISHED PROCEEDINGS (DOMESTIC - IN CZECH)

T. Reichrt, J. **Schröfel** and P. Nekvindová, „Measurement of Electrooptic Properties of Optical Waveguides Prepared in Lithium Niobate Substrates Using APE Method“, *Proceedings of the Conference Optical Communications O.K.´2001*, Prague, pp.96-100, 2001

I. Hüttel, J. **Schröfel,** P. Nekvindová, J. Gurovič, F. Černý and V. Prajzler: „Carbon Layers for Passive and Active Optical Waveguides“, *Proceedings of the Conference Optical Communications O.K.´2001*, Prague, pp. 86-90, 2001

P. Hříbek, M. Slunečko, **J. Schröfel,** P. Nekvindová and J. Špirková, „Measurement of Optical Loss of Planar Waveguides Using Optical Phase Conjugation in $BaTiO_3$ Crystal“, *Proceedings of the Conference Optical Communications O.K.´2001*, Prague, pp.120-125, 2001

PRINTED LECTURES
(IN CZECH)

F. Vaníček, Electronic Components - Examples, Editorial Centre of the CTU in Prague, Prague, 2001

RESEARCH REPORTS
(IN ENGLISH)

J. Jakovenko, M. Husák, „ConventorWare (MEMCAD) Thermo-Mechanical Simulation of GaAs Based Membrane Bridge“ Report No. Jak-2/2001, NATO SfP-974172, 2001

J. Jakovenko, M. Husák, „MEMCAD Thermal Simulation of GaAs Based Membrane Bridge“, Report No. Jak-1/2001, NATO SfP-974172, 2001

Georgakilas, T. Lalinský, **M. Husák**, L. Grňo, **J. Jakovenko**, „Microwave Monolitihic Integrated Transmitted Power Sensors and Their Industrial and Metrological Application“ Six-Monthly Progress Report, STU Bratislava, 2001

Georgakilas, T. Lalinský, **M. Husák**, L. Grňo, **J. Jakovenko**, „Microwave Monolitihic Integrated Transmitted Power Sensors and Their Industrial and Metrological Application. Six-Monthly Progress Report, STU Bratislava, 2001

V. Janíček, J. Jakovenko, M. Kirschner, M. Husák, „Characterization of Library Macrocells in BCD Process: RC-Clock Generator for Automotive Application“ Report No.STM 2000/1, EADC ST Microelectronics, Munich, 2001

V. Janíček, J. Jakovenko, M. Kirschner, M. Husák Characterization of Library Macrocells in BCD Process: Ground Compatible Pulsed Contact Monitor Cell for Automotive Application. Report No. STM 2000/2, EADC ST Microelectronics, Munich, 2001

V. Janíček, J. Jakovenko, M. Kirschner, M. Husák „Characterization of Library Macrocells in BCD Process: Standby Voltage Regulator Cell for Automotive Application“, Report No. STM 2000/3, EADC ST Microelectronics, Munich, 2001

V. Janíček, J. Jakovenko, M. Kirschner, M. Husák, „Characterization of

Library Macrocells in BCD Process: Band-gap Voltage Reference Cell for Automotive Application", Report No. STM 2000/4, EADC ST Microelectronics, Munich, 2001

Z. Rozehnal, P. Hazdra, V. Záhlava, J. Vobecký, MCS91DP256 Current Injection Capability Investigation, FEE-CTU in Prague, MOTOROLA Munich, 2001

RESEARCH REPORTS (IN CZECH)

M. Husák et al. „Integrated Intelligent Microsensors and Microsystems", Research Activities Summary for the Year 2000, CTU in Prague, 2001

B. Palán, Design of pH-ISFET Sensor in 0.6um CMOS Technology and Noise Measurments", CTU in Prague, 2001

J. Schröfel, J. Špirková-Hradilová, J. Čtyroký, P. Hříbek, V. Peřina, **M. Slunečko**,
P. Nekvindová, F. Folttiny, *"New Technologies for Dielectric Waveguide Lasers and Amplifiers",* Project No. 102/99/1391, Grant Agency of Czech Republic, 2001

E. Hulicius, I. Hüttel, J. Toušková, J. Humlíček, **J. Schröfel,** *"MOVPE Prepared Materials and Structures for Electronic and Optoelectronic Devices",* Project No.102/99/0414, Grant Agency of Czech Republic, 2001

I. Hüttel, **J. Schröfel,** J. Špirková, J. Čtyroký, *"New Technologies for Passive and Active Planar structures Based on Carbon and Carbon Nitride for Integrated Optics",* Project No. 102/00/0895, Grant Agency of Czech Republic, 2001

J. Voves, P. Hazdra, „Design and Simulation of MBE grown Semiconductor Structures", Research Report no. 4020017334, FEE-CTU in Prague, 2000

J. Voves, P. Hazdra, V. Stejskal, Z. Lukeš „Chracterisation and Simulation of MBE Grown Semiconductor Structures", Research Report no,4021022334, CTU in Prague, 2001

PhD. Thesis

B. Palán, „Design of Low Noise pH-ISFET Microsensors and Integrated Suspended Inductors with Increased Quality Factor Q“ Dissertation, Prague 2001

POPULARIZATION PAPERS AND LECTURES (IN CZECH)

L. Lhotská, **P. Hazdra,** J. Tůma, F. Vejražka, „4th International Student Conference on Electrical Engineering POSTER 2000“, *Proceedings of the WORKSHOP 2001*, Vol.5, Prague, pp. 368-369, 2001

M. Husák, „Microsystem Education in Structured Study“, *Proceedings of 17.International μworkshop*, Trnávka – Želiv, pp,46- 48, 2001

M. Husák, „Enviroment in Research“, *Proceedings of 17.International μworkshop*, Trnávka – Želiv, pp.43 – 45, 2001

M. Husák, „Structured Study in FEE“, *Proceedings of 17.International μworkshop*, Trnávka – Želiv, pp.29 – 39, 2001

M. Husák, Department Research and Research Programmes“, *Proceedings of 17.International μworkshop*, Trnávka – Želiv, pp.40 – 42, 2001

F. Vaníček, “Microelectronics Department of the CTU-FEE in Prague“, *20 Years of the Institute of Microelectronics FEI-TU Brno - Procedings*, Brno, p.49, 2001

EDITORIAL WORKS

P. Hazdra, L. Lhotská, „5th International Student Conference on Electrical Engineering POSTER 2001”, *Book of Extended Abstracts,* Prague, 392 pages, 2001

V. Musil, **M. Husák**, „17th International Microworkshop“, *Proceedings,* Trnávka – Želiv, 185 pages, 2001

DIPLOMA WORKS

P. Čapek,	“Preparation and Basic Characterization of Semiconductor Lasers in Mid Infrared Region”
V. Dvořáček,	“Emulator of XC1700 Serial Configuration Memories”
P. Dymák,	“Measurement of Dispersion of Optical Waveguide Doped by Rare Soils Elements”
O. Fafejta,	“Music Signals Analysis”
M. Genčev,	“Realization of Diffusion Sound Using Signal Processor”
V. Gronát,	“Design of Test Vectors for Digital Part of Cardio-Stimulator Output Stage”
J. Hájek,	“EMC on PCB”
J. Havlík,	“Design of Charging Station for NiCd Accumulators”
J. Holý,	“Electronic Altitude Meter”
J. Gillar,	“Detection of Motion in Picture, Compression and Graphics Data Transmission“
P. Holík,	“Microprocessor Controlled Amplifier with Variable Gain”
M. Hurych,	“Optical Waveguide Sensor for Temperature Measurements”
M. Jeřábek,	“Design of Primary and Secondary Protections of Metallic Line Termination ”
J. Jireš,	“Application of JTAG (Boundary Scan) on the Boards of MEDIO System”
J. Karel,	“Synthesis of Switched Currents Filters”
P. Kliment,	“Measurement of Properties of UV Radiation Detectors”
M. Laštovic,	“Measurement of Physical Activity Using Two Different Signals of Heart Pulse and Accelerometer”

A. Mačkal,	“Phase-Sensitive Detection in Integrated Optical Sensor with Surface Plasmons”
L. Macháček,	“A Flexible Prototyping Framework for Reconfigurable Radio Applications”
M. Mužík,	“Application of Speech recognition Methods in Telecommunication System”
J. Novotný,	“Suppression of Additive Noises for Recognition Purposes”
T. Olexa,	“Real Time Music Effects”
M. Pastorek,	“Portable Welding Machine”
J. Pech,	“Acquisition of Image Data”
T. Pinkas,	“Programmable System for Temperature Control and Contactless Transmission of Sensor Data”
P. Prášek,	“Emphasizing of Formant Frequencies”
V. Prajzler,	“Design and Research of Optical Waveguides on the Basis of Carbon and its Compunds”
F. Provazník,	“A Study of Dielectric Planar Optical Waveguides Prepared Using Diffusion Techniques
T. Reichert,	“Research of Electro-Optical Properties of Lithium Niobate Planar Waveguides”
D. Řehák,	“Data Processing During External Blood Circulation”
J. Semrád,	“Adaptive Detection Algorithms of Seismic Signals”
M. Srb,	“Parallel Processing in Speech Recognition”
J. Svoboda,	“Application of Coherent and Spectral Methods for Analysis of Biological Signals”
A. Sýkora,	“Optical Waveguides for Integrated Optics”

J. Sysr, "Analysis and Simulation of Analog Power Supply for Cardio Stimulator DA+"

P. Šmíd, "MP3 Hardware Player"

K. Štefl, "Sensor Equipment for Car Protection"

O. Šubrt, "Active Functional Blocks in the Current Mode"

V. Švagr, "Noise Suppression in Speech Signal Using Kalman Filtering"

L. Třísková, "Methods of Speech Compression"

M. Zábrodský, "Evanescent Detection of HydroCarbon Using Optical Waveguide PCS Sensors"

T. Zeman, "Blind Separation of Signal"

K. Znojemský, "Analysis of Guitar Effect Reliazed by Electron Tube Amplifier and its Implementation Using Signal Processor"