

## DEPARTMENT OF PHYSICS

### 1 General Information

Advances in technical fields have always relied to a large degree on know-how and methods originating in Physics. Many phenomena and principles studied in Physics today become the basis of applications tomorrow, e.g. in quantum information science. It is therefore very important to provide the students of the technical fields with good basics of Mathematics and Physics.

The Department of Physics teaches General Physics to students of all faculties of the University and Advanced Physics for some special courses. The Department provides the students with the basic understanding of physics, trains them in applying the principles of physics to various engineering problems as well as gives the students a review of modern physics.

The Department is divided into three sections according to their research and educational specialisation. The staff consists of 1 Professor, 2 Associate Professors at the position of a Professor, 5 Associate Professors, 12 senior lecturers, 5 internal Ph.D. students, 4 research fellows and 3 technical/administrative workers who support the research and teaching activities of the Department.

The research carried out at the Department is mostly concerned with the utilization of acoustic and optical wave processes for the investigation of condensed matter. Acoustic Group exploits a wide range of acoustic methods and techniques as well as acoustoelectric and acoustooptic phenomena to investigate semiconductors, metals, ion glasses and magnetic liquids. New acoustic techniques are also developed.

Optical group studies physical properties of the conventional telecommunications optic fibres and special fibres such as capillary fibres and photonic fibres. The group has extended its activities to include technologies of preparation and analysis of photonic structures for integrated optics and optoelectronics. The latest results are from the area of optofluidic waveguides where sensors and optic elements are being developed. Self-diffraction of light in magnetic fluids and photorefractive phenomenon in selected condensed matter materials are also studied within the group.

The theoretical high-energy physics group works in the area of strong electroweak symmetry breaking and quark-gluon plasma.

The research groups of the Department are also well known abroad. The scientific activities of the Department are regularly presented at the international conferences and are published in significant physical journals. The members of the staff also participate in various educational and scientific activities outside the Department and the University, especially as members of various scientific boards at both domestic and international institutions. There are also many activities focused on further education of high school and elementary school Physics teachers and their pupils and students, which is an important outreach work.

### 2 Staff of the Department

Head of the Department	: Peter Bury
Vice-head of the Department	: Dušan Pudiš
Secretary for Education	: Gabriela Tarjániová
Administrative Support	: Anna Chasníková
Technical Support	: Nadežda Remencová, František Černobila, Juraj Remenec (1/3)

## 2.1 Sections of the Department

### 2.1.1 Section of Acoustics and Materials

Head of the Section	: Peter Bury
Professor	: Peter Bury
Associate Professors	: Peter Hockicko, Igor Jamnický, Jozef Kúdelčík, Sofia Slabeyciusová
Senior Lecturers (with PhD)	: Marián Janek (½), Peter Sidor (until 30.6.2013)
Senior Lecturers (without PhD)	: Ivan Bellan

### 2.1.2 Section of Optics and Photonics

Head of the Section	: Dušan Pudiš
Associate Professors	: Daniel Káčik, Ivan Martinček, Dušan Pudiš
Senior Lecturers (with PhD)	: Jana Ďurišová (maternity leave), Ivana Lettrichová, Ľuboš Šušlík, Norbert Tarjányi

### 2.1.3 Section of General Physics and Elementary Particles

Head of the Section	: Ivan Melo
Research Fellows	: Mikuláš Gintner, Ivan Melo
Senior Lecturers (with PhD)	: Marián Janek (½), Beáta Trpišová, Gabriela Tarjányiová

### 2.1.4 Postgraduate Students

Internal	: Jozef Drga (until Aug 31, 2013), Peter Gašo, Štefan Hardoň, Daniel Jandura, Peter Tatár, Lukáš Varačka (since 1.9.2013)
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## 3 Education

### 3.1 Courses in Bachelor and Master Degree Programmes

#### 3.1.1 Bachelor Degree Programmes

Code	Title	Semester	Hours/week	Lessons-Seminars-Lab. exercises	Teachers
<i>Courses at the Faculty of Electrical Engineering</i>					
31110	Introduction to Physics	1	1 - 2 - 0		Tarjányiová
31201	Physics I	2	3 - 2 - 1		Bury, Pudiš, Káčik
31303	Physics II	3	3 - 2 - 1		Bury, Pudiš
31307	Computer Simulation of Real Processes	3	1 - 0 - 2		Jamnický, Kúdelčík
31450	Basics of Optoelectronics	4	2 - 1 - 0		Tarjányi
31315	Chapters of Physics	3	2 - 1 - 0		Pudiš

*Courses at the Faculty of Mechanical Engineering*

2B010 Seminar on Physics	1	0 - 2 - 0	Trpišová
2B018 Physics I	2	3 - 2 - 0	Martinček, Slabeyciusová
2B033 Physics II	3	2 - 0 - 2	Martinček, Slabeyciusová
2B018 Physics I (External studies)	2	20 - 6 - 0	Slabeyciusová
2B033 Physics II (External studies)	3	20 - 6 - 0	Slabeyciusová

*Courses at the Faculty of Management Science and Informatics*

5BF005	<i>Fundamentals of Physics</i>	1	3 - 1 - 1	Martinček
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*Courses at the Faculty of Civil Engineering*

4B113 Physics	1	2 - 1 - 1	Kúdelčík
4B117 Seminar on Physics	1	0 - 2 - 0	Kúdelčík
4B203 Physics - optics	2	2 - 1 - 0	Lettrichová
4B202 Physics I	2	2 - 1 - 1	Hockicko, Kúdelčík
4B211 Chapters of Physics	2	0 - 2 - 0	Hockicko
4E202 Physics – (External studies)	2	12 - 8 - 0	Tarjányi
4E211 Chapters of Physics - (External studies)	2	10 - 0 - 0	Tarjányi

*Courses at the Faculty of Operation and Economics of Transport and Communication*

11P101 Physics	1	2 - 1 - 1	Jamnický, Hockicko
11P102 Physics	1	2 - 1 - 1	Hockicko
12P101 Physics (External studies)	1	8 - 4 - 4	Hockicko
12P102 Physics (External studies)	1	12 - 0 - 4	Káčik
12P103 Physics (External studies)	1	16 - 0 - 0	Hockicko

*Courses at the Faculty of Humanities*

8BT151 Computer Physics II	6	0 - 1 - 2	Kúdelčík
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*Courses at the Faculty of Special Engineering*

92026 Physics	2	2 - 1 - 1	Jamnický
97026 Physics (External studies)	2	18 - 0 - 0	Trpišová

## 3.1.2 Master Degree Programmes

*Courses at the Faculty of Humanities*

8BT235 Applications of wave processes	3	2 - 0 - 2	Bury
8BT221 Statistical methods in physics	2	2 - 1 - 0	Melo
8BT248 Physical acoustics	4	2 - 1 - 0	Bury

### 3.1.3 Engineering Degree Programmes

#### *Courses at the Faculty of Electrical Engineering*

32109 Physics III	1	2 - 1 - 0	Pudiš
32321 Measurements in telecommunications 4	3	0 - 0 - 2	Káčik
32410 Physics of accelerators	2	2 - 2 - 0	Melo, Gintner

### 3.2 Courses in the framework of Erasmus

#### *Faculty of Electrical Engineering*

31307 Computer modelling of real processes	4	1 - 0 - 2	Jamnický, Kúdelčík
31450 Basics of optoelectronics	4	2 - 1 - 0	Tarjányi
31446 Introduction to semiconductors	4	3 - 1 - 1	Pudiš

### 3.3 Courses in doctoral studies

#### *Faculty of Civil Engineering*

4D102 Applied Physics	1	2 - 0 - 0	Bury
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## 4 Science, research and development

The research carried out at the Department is mostly concerned with the utilization of acoustic and optical wave processes for the investigation of condensed matter. Acoustic Group exploits a wide range of acoustic methods and techniques as well as acoustoelectric and acoustooptic phenomena to investigate semiconductors, metals, ion glasses and magnetic liquids. New acoustic techniques are also developed. Acoustic group has reached important results during investigation of semiconductor MOS layers with so-called high-K dielectric layers (Si-SiO<sub>2</sub>-HfO<sub>2</sub>), during studies of magnetic fluids on the basis of the transformer oil, as well as studies of LiPON type ion glasses, published in 2013 in 3 current contents journals and two WOS journals.

Optical group studies physical properties of the conventional telecommunications optic fibres and special fibres such as capillary fibres and photonic fibres. The group has extended its activities to include technologies of preparation and analysis of photonic structures for integrated optics and optoelectronics. The latest results are from the area of optofluidic waveguides where sensors and optic elements are being developed. Self-diffraction of light in magnetic fluids and photorefractive phenomenon in selected condensed matter materials are also studied within the group. Dosiachnuté výsledky skupina prezentuje v karentovaných časopisoch. Most important results were achieved in the special optical fibers and fiber devices for sensor applications. In the field of active devices, the new types of light emitting diodes with patterned surface using photonic structures and polymeric membranes were prepared. Such types of optic and optoelectronic devices show unique properties especially light extraction and light guiding.

The theoretical high-energy physics group works in the area of strong electroweak symmetry breaking and quark-gluon plasma. Understanding of electroweak symmetry breaking (EWSB) is one of the most important problems of particle physics. In spite of recent

discovery of 125 GeV scalar particle at the LHC accelerator at CERN there remain questions about the true nature of EWSB mechanism and hence about physics behind the Standard Model (SM). Properties of the discovered boson are compatible with the SM Higgs boson hypothesis, nevertheless they are also compatible with many extensions of SM. In collaboration with Dr. Juráň from Silesian University in Opava we constructed and kept studying so-called *top-BESS model* with SU(2) isospin triplet of vector resonances as effective description of spontaneous EWSB. Results were published in the most important scientific journals Physical Review D and the European Physical Journal C and contacts were established with S. Pokorsky from Warsaw university, C. Grojean from Theory Division at CERNe and F. Riva from ITF EPF in Lausanne.

#### 4.1 Acoustic Laboratory

Laboratory is oriented towards studies of physical properties of materials and structures with acoustic methods. Three acoustic spectrometers serve this purpose, each equipped with unique technology for the generation, detection as well as processing of acoustic signals. The laboratory also features two magnets for investigation of magnetic and acousto-magnetic properties of condensed matter and facilities for investigation of dielectric properties of materials.

#### 4.2 Technology Laboratory

Laboratory serves for the preparation of samples for either optical or acoustic investigation. It has facilities for cutting and grinding the samples and facilities for evaporation or deposition of solid metal layers and resistors.

#### 4.3 Optics Laboratory

Laboratory is focused on research and development of optical fibres, optical fibre sensors, optical fibre elements and optical materials. During the research we use and develop various types of interferometry methods and interferometers, methods of measurement of optical radiation absorption in fibres and optical materials, and methods of refractive index measurement. Laboratory has different types of semiconductor and gas lasers, light sources in the visible and near infrared region, spectrometers operating in the wavelength range 350 – 2200 nanometers and elements for imaging and fibre optics.

#### 4.4 Laboratory of fibre technologies

Laboratory of fibre technologies is oriented towards preparation of optical fibres and fibre structures from different types of optic materials. Laboratory features optical fibre pulling tower, which can be used to prepare optical fibres from fused quartz and other types of optical glasses. In the laboratory we develop technologies of preparation of optical fibres, optical fibre elements and microfluid optical elements from siloxane polymers, such as polydimethylsiloxane LS 6941, LS 6943, LS 6946 and Sylgard 184.

#### 4.5 Laboratory of laser technologies

Laboratory features cutting edge laser technologies for preparation of planar photonic structures. The basic technology is interference lithography where one can achieve photonic structures with various 2-dimensional symmetry and a resolution at the level of hundreds of nanometers. Another technology offers a possibility to create planar structures with arbitrary arrangement using tapered optic fiber probes in the near field scanning. This is known as the near field lithography. The final on the list is the technology of direct inscription with laser beam, which enables to create structures of arbitrary arrangement in surfaces of different materials with submicrometer resolution. Laboratory is prepared for implementation of

photonic and arbitrary structures with a resolution of a few hundred nanometers into surfaces of optic and optoelectronic elements.

## 5 Scientific, Research and Educational Projects

### 5.1 National Projects

#### 5.1.1 Research Projects Funded by the Scientific Grant Agency of the Slovak Republic (VEGA)

##### ***VEGA 1/0457/12 Strongly interacting matter in nuclear collisions and compact stars***

Summary: Project deals with selected topics from physics of nuclear collisions and compact stars.

Realization: 01/2012 – 12/ 2014

Coordinator: Boris Tomášik, UMB Banská Bystrica

Co-operators: Ivan Melo

##### ***VEGA 2/0045/13 Sensitivity of liquid crystals with nanoparticles to external magnetic field***

Summary: Some processes in systems with nanoparticles are studied, in particular in magnetic fluids and magneto-optic films with significant Faraday effect. First part of the project is devoted to studies of the structure and dielectric properties, heat conduction, ageing process, partial discharges and both d.c. and a.c. hopping in new magnetic fluids based on transformer oils. The purpose is to prepare transformer oils with better dielectric and thermal properties as in the case of clean transformer oil, so they could be used as more effective cooling medium as a result of the magneto-convection. The purpose is to utilize them in various areas of high-power electronic. The second part of project is oriented towards the preparation of magneto-optical films in the form of polymeric, in magnetic field structuralized nanoparticles of various shape and to the study of their magneto-optic properties.

Realization: 2013-2016

Coordinator: Dr. Kopčanský, ÚEF SAV Košice

Coordinator for Žilina: Peter Bury

Co-operators: Jozef Kúdelčík, Marián Janek

##### ***VEGA 1/0624/13: Analyze of insulation state of oil distribution transformers with respect to investigation of adverse effects.***

Summary: The project is devoted to analysis of insulation state of oil distribution transformers with respect to investigation of adverse effects of operations and environment. The main attention is devoted to diagnostics of transformer insulation parameters. We will analyze the effect of short circuit, overvoltages, effect of environments and further operation factors for the effect on degradation insulation of transformer. Another aim will be devoted to the detailed study of the characteristics of partial discharges in transformer oil, which have direct effect on the degradation of insulating state. We will describe the

process of their creation, development and impact on transformer insulation degradation. We will prepare new measurement techniques and diagnostic method for determination of the insulation state degradation of oil distribution transformers (oil, paper, bushings, winding insulation).

Realization: 01/2013 – 12/2015  
Coordinator: Jozef Kúdelčík  
Sub-coordinator: Miroslav Gutten  
Co-operators: Peter Bury, I. Bellan, L. Varačka

***VEGA 1/0528/12 Research and development of optofluidic fibres for sensor and photonic applications***

Summary:

The aim of the project is to acquire theoretical knowledge about optofluidic fibres based on optical glasses in combination with appropriate fluids and their implementation into practical application for design, preparation and characterization of this kind of fibres. The subject of the project is the design of optofluidic fibre structures composed of optical glass and fluid in order to the application in sensorial, photonic and optoelectronic application, as well as preparation and characterization of these optofluidic fibres with designed structures. Static and dynamic optical properties of optofluidic fibres will be examined in visible and near infrared region of electromagnetic spectrum. Gained knowledge will be employed for a design of photonic devices based on optofluidic fibre properties, as tunable optical sensor attenuators, optical power limiters, optical fiber switches and sensors.

Realization: 01/2012- 12/2014  
Coordinator: Ivan Martinček  
Cooperators: Dušan Pudiš, Daniel Káčik, Norbert Tarjányi, Ľuboš Šušlik, Ivana Kubicová, Dalibor Blažek, Jakub Porubčan, Jana Ďurišová

***VEGA 1/1058/11 NSOM lithography and interference lithography as an advanced method for the preparation of the photonic structures and optoelectronic devices with photonic structures.***

Summary:

Project is focused on the preparation of the photonic structures for the optoelectronic devices by employment of the lithographic methods as the NSOM and the interference lithography. These lithographic techniques and their combination allow prepare the photonic structures for optoelectronic devices with the period of order of few hundreds nanometers. In combination with the optimisation of the optical properties in the program FDTD the unique laboratory of the photonic structures will be established with possibilities of the complex photonic device design, optimisation and diagnostics in the area of photonic structures.

Realization: 01/201 – 12/2013  
Coordinator: Dušan Pudiš

Co-operators: Daniel Káčik, Norbert Tarjányi, Ivan Martinček  
Slabeyciusová, Ľuboš Šušlik, Ivana Kubicová,  
Peter Tvarožek

#### 5.1.2 Projects Funded by the Cultural & Education Grant Agency (KEGA)

##### **KEGA 022ŽU-4/2013 *Discovering the World of Particles*** (joint project of ŽU, UMB and UPJŠ)

Summary: The goal is to mobilize high energy physics community in the area of outreach and informal education, to make a step towards a community formed by physicists, teachers, students and high school students. Another goal is to raise interest of the young generation in science using enquiry based learning and the creation of the web portal „The world of particles“ - communication platform of the new community.

Realization: 01/2013 – 12/2015

Coordinator: Ivan Melo

Co-operators from ŽU: Gabriela Tarjányiová, Jozef Kúdelčík, Beáta Trpišová,  
Mikuláš Gintner

##### **KEGA 035ŽU-4/2012: *Forming of physical concepts using videoanalysis and videomeasurements with the aim to popularize physics and make it more attractive***

Summary: The project is focused on the preparation of supplementary study materials for the subject physics that are intended for the grammar and high school students and could be also used for both one-term and two-term basic physics courses. By preparing videoexperiments and through the realization of videomeasurements we want to build in students the correct conception about processes and phenomena around us. The prepared set of videoexperiments will be placed at the World Wide Web so that it will be accessible to all teachers and students at all levels of the educational process as an aid serving whether for a visual demonstration, explanation or a mathematical or a physical analysis of the given process.

Realization: 01/2012 – 12/2014

Coordinator: Peter Hockicko

Co-operators: Jozef Kúdelčík, Beáta Trpišová, Marián Janek, Gabriela Tarjányiová

##### **KEGA 002KU-4/2011: *Development of Scientific Literacy in University Preparation of Students of Pre-school and Elementary School Pedagogy***

Realization: 01/2011 – 12/2013

Coordinator: Ivana Rochovská, KU Ružomberok

Co-operators: Peter Hockicko

#### 5.1.3 Research Projects Funded by the Slovak Research and Development Agency (APVV)

##### **APVV–0050–11 *Strongly interacting matter in extreme conditions (SIMEX)***

Summary: Project deals with open problems of behaviour of strongly interacting matter in extreme conditions i.e.



at high temperatures and/or high densities of nuclear matter.  
 Realization: 07/2012 – 12/2015  
 Coordinator: Štefan Olejník, Institute of Physics, SAS  
 Co-operators: Ivan Melo

**APVV-395-12 Photonic structures for integrated optoelectronics**

Summary: Project focuses on research and realization of active and passive elements with implemented photonic structures for integrated optoelectronics and optics. In the area of active elements the project focuses on research and realization of semiconductor LEDs and photodetectors with photonic structures. For passive elements, the project aims to the research of optical waveguides with integrated photonic structures inside the waveguide.  
 Realization: 01/2013-12/2016  
 Coordinator: Dušan Pudiš  
 Co-operators from ŽU: Ivan Martinček, Ivana Lettrichová, Ľuboš Šušlik, Daniel Káčik, Norbert Tarjányi, Daniel Jandura, Peter Gašo, Sofia Slabeyciusová

5.1.4 Projects of European Structural Funds

**26220120046 Center of excellence for power electronics and their material components II**

Summary: The goal is to equip laboratories for research and development of materials for components of power electronics systems with modern apparatus which will meet requirements for the current top research.  
 Coordinator Activities 2.1: Peter Bury  
 Co-operators: Ivan Bellan, Peter Hockicko, Igor Jamnický, CSc., Daniel Káčik, Jozef Kúdelčík, Ivan Martinček, Dušan Pudiš, Norbert Tarjányi, František Černobila

**26220120079: Innovation and internationalization of education - tools to improve quality of University of Zilina in the European education space**

*Activity 1.3 Creation and innovation of study programmes with emphasis on the needs of job market and knowledge society – Accreditation of the study programme „Photonics“*

Co-operators: Peter Bury, Dušan Pudiš, Ivan Martinček, Norbert Tarjányi, Ľuboš Šušlik, Marián Janek, Jozef Kúdelčík, Daniel Káčik, Ivana Lettrichová

**26220220118 Development of optimal technology for analysis of limiting states of construction elements in contact**

Realization: 01/2010 – 10/2013  
 Coordinator: Milan Žmindák, SjF  
 Co-operators: Sofia Slabeyciusová

**26110230060 „Development of culture of quality at university of Žilina on basis of european standards of university education“**

Summary: To create a strategy for permanent improvement of quality at university which includes a system of information management directed inside and outside university.

Realization: 02/2012 – 1/2013

Co-operator Activity 1.3: Peter Hockicko

***ITMS 26220220089 “New methods of measurement of physical dynamic parameter and interactions of motor vehicles, traffic flow and road”***

Coordinator: Betamont  
Coordinator from ŽU: KRIS EF ŽU in Žilina  
Co-operators: Daniel Káčik, Norbert Tarjányi

### 5.1.5 Other national projects

***052/12 Foundation Volkswagen Slovakia „Know the braking distance of your car“***

Summary: We recorded braking processes at different initial velocities and obtained videos from which braking distances of various automobiles at different conditions (snow and summer tyres, drought, rain, snow) and average decelerations were determined. Prepared materials are on the web to help in teaching.

Realization: 02/2013 – 10/2013

Coordinator: Peter Hockicko

## 5.2 International Projects

### 5.2.1 COST Projects

***Action TD1001: Novel and Reliable Optical Fibre Sensor Systems for Future Security and Safety Applications (OFSeSa)***

Summary: *Optical fibre sensors offer finite solution for monitoring of extreme parameters associated with safety and safety applications. While advantages of these sensors are well known, there is the whole list of problems which need to be addressed.*

Realization: 11/2010 - 11/2014  
National coordinator: Daniel Káčik  
Co-operators: Ivan Martinček, Dušan Pudiš, Norbert Tarjányi, Peter Tvarožek, Ľuboš Šušlik, Ivana Kubicová

### 5.2.2 Other International Projects

***02-1-1097-2010/2015: Study of spin effects in few nucleon systems***

Summary: The project aim is to study the spin structure of the deuteron and three nucleon systems at short distances by measuring the polarization observables of reactions induced by deuterons at intermediate energies. The reason for such research is the lack of experimental data which aren't in good agreement with the theoretical calculations. Energy and angular distributions of the polarization observables can

Realization: 03/2013 – 12/2013  
 Coordinator: Marián Janek  
 Co-operators: V.P. Ladygin, SÚJV, Dubna, Russia

**PROJECT of EUROPEAN PHYSICAL SOCIETY INTERNATIONAL PHYSICS  
 MASTERCLASSES 2013**

(<http://wyp.teilchenphysik.org/mc.htm>)

Summary: High school students spend one day with physicists of elementary particles during which they learn to evaluate real experimental data from LHC accelerator.

Realization: annually  
 National coordinator: Ivan Melo  
 Sub-Coordinator: Gabriela Tarjányiová  
 Co-operators : Mikuláš Gintner, Beáta Trpišová, Jozef Kúdelčík, Gabriela Tarjányiová, Remenec, Ivana Kubicová, Marián Janek

## 6 Co-operation

### 6.1 Co-operation Partners in Slovakia

- International Laser Center, Bratislava
- Institute of Electrical Engineering, Slovak Academy of Sciences
- Institute of Physics, Slovak Academy of Sciences, Bratislava
- Dept. of Microelectronics, FEI STU Bratislava
- Institute of Experimental Physics, Slovak Academy of Sciences, Košice
- Matej Bel University, Banská Bystrica
- FMFI Comenius university, Bratislava
- University of P.J. Šafarik, Košice
- Faculty of Aeronautics - Technical University of Košice
- Volkswagen Bratislava
- Betamont Zvolen

### 6.2 International co-operation Partners

- Institute of Physics, Faculty of Philosophy and Natural Sciences, Silesian University in Opava, CZ
- Lublin University of Technology, Lublin, PL
- Université de Mons - Faculty Polytechnique, Belgium
- ISIR, Osaka University, Japan
- CERN, Switzerland
- International Particle Physics Outreach Group
- IPHT Jena, Germany
- Joint Institute of Nuclear Research, Dubna, Russia
- Instituto do Ceramica y Vidrio (CSIC), Madrid, Spain
- Institute of Technical and Experimental Physics, ÚTEF ČVUT Prague, CZ
- ZCU Plzen, CZ
- ITF EPF, Lausanne, Switzerland

### 6.3 Visitors to the Department

<i>Name</i>	<i>Institution</i>	<i>Length of stay</i>
Prof. Marc Wuilpart	University	5 days
Prof. Hans Arwin	University of Linköping, Sweden	4 days
Prof. Iwan Kityk	Czestochowa University of Technology, Poland	1 day
Francisco Munoz	Instituto de Ceramica y Vidrio (CSIC), Madrid, Spain	5 days
Dr. Josef Juráň	Silesian University, Opava, CZ	20 days
Prof. Tomasz Szoplík	Warsaw university, Poland	5 days

### 6.4 Visits to Foreign Institutions

<i>Name</i>	<i>Institution</i>	<i>Length of stay</i>
Ivan Melo	Madrid, Spain	2 days
	Cern, Switzerland	3 days
	Cern, Switzerland	10 days
	Budapest, Hungary	3 days
Marián Janek	JINR, Dubna, Russia	14 days
Jozef Kúdelčík	Lublin University of Technology FEECC Poland	7 days
Peter Hockicko	KU Leuven, Belgium	6 days
	University of Vienna, Austria	3 days
Mikuláš Gintner	Silesian University, Opava, CZ	17 days
	UTEF ČVUT, Prague, CZ	20 days
	CERN, Geneva, Switzerland	12 days
	ITF EPF, Lausanne, Switzerland	1 day

## 7 Other Activities

### 7.1 Conferences, Workshops, Symposiums Organized by the Department

- Advances in Electronics and Photonics (ADEPT) 2013 1st. International Conference, Nový Smokovec, 2. – 5. 6. 2013, Chair of Organizing Committee Dušan Pudiš.
- Seminar – introduction of the Section Optic design from the Dept. of research and development of the company OMS s r.o., 1.2.2013 Dept. of Physics, Norbert Tarjányi.
- 9th International Particle Physics Masterclasses 2013, University of Žilina, Mar 6, 2013. Ivan Melo – national coordinator, Gabriela Tarjányiová – main coordinator, Mikuláš Gintner, Beáta Trpišová, Jozef Kúdelčík, Ivana Kubicová, Marián Janek, Juraj Remenec.
- National High School Competition Cascade, <http://fyzika.uniza.sk/cascade/>, Mar – Jun 2013. Organizers: Ivan Melo

### 7.2 Specialised Lectures and Courses Organized by the Department

*Title of Lecture/Course:* Masterclasses in Physics 2013  
Customer: high school students from Žilina region  
Lecturer: Mikuláš Gintner, Ivan Melo  
Date: 6.3.2013

*Title of Lecture/Course:* Measurement on ferromagnetic material  
Customer: KF EF ŽU  
Lecturer: Marián Janek  
Date: 29.01.2013

*Title of Lecture/Course:* Spectroscopic ellipsometry: a selection of examples from research on materials, sensors and biolayers  
Customer: KF EF ŽU  
Lecturer: prof. Hans Arwin Linköping University, Sweden  
Date: 12.03.2013

*Title of Lecture/Course:* Is geometry of the Universe at large scales Euclidean?  
Customer: KF EF ŽU  
Lecturer: Július Štelina  
Date: 28.05.2013

*Title of Lecture/Course:* Presentation of renewed laboratory exercises  
Customer: KF EF ŽU  
Lecturer: Gabriela Tarjániová, Ivan Bellan, Marián Janek  
Date: 24.09.2013

*Title of Lecture/Course:* Photoinduced nonlinear optical methods as effective tool for studies of condensed matter  
Customer: KF EF ŽU  
Lecturer: prof. Iwan V. Kityk Czestochowa University Technology, Czestochowa, Poland  
Date: 09.04.2013

### 7.3 Invited Lectures/Papers

*International Masterclasses in Particle Physics*  
Lecturer: Ivan Melo  
Where/Date: UMB Banská Bystrica, broadcast to Košice and Bratislava, 11.04.2013

*Plenary lecture „IPPOG Bringing particle physics into classrooms“*  
Lecturer: Ivan Melo  
Where/Date: HSCI international conference 01.05.2013-05.07.2013

*Breakdown in transformer oil*  
Lecturer: Jozef Kúdelčík  
Where/Date: Politechnika Lubelska, Wydział Elektrotechniki i Informatyki, Lublin, Poland, / 25.05.2013

*Wave optics*

Lecturer: Norbert Tarjányi  
Where/Date: Bilingválne Gymnázium, Žilina, SR / 31.1.2013

*Top-BESS model extended by 125 GeV scalar*

Lecturer: Mikuláš Gintner  
Where/Date: UTEF ČVUT, Prague, CZ / 14.6.2013

*A CompHEP Tour*

Lecturer: Mikuláš Gintner  
Where/Date: UTEF ČVUT, Prague, CZ / 5.11.2013

*Photonic structures for optoelectronic devices and integrated optoelectronics*

Lecturer: Dušan Pudiš  
Where/Date: Warsaw, Poland, 16-19 Sept 2013

#### 7.4 Membership in International Institutions /Committees

- Ivan Melo - Slovak delegate in IPPOG (International Particle Physics Outreach Group)  
- Slovak delegate in EPPCN (European Particle Physics Communication Network)
- Peter Bury - chairman of the National IUPAP Committee (International Union for Pure and Applied Physics)  
- member of Scientific Committee of NEET conference 2013, Zakopané, PL
- Peter Hockicko - Member of SEFI (European Society for Engineering Education), PWG (Working Group on Physics), Slovak delegate  
- Member of EUCU.NET (European Children's Universities Network)
- Norbert Tarjányi - EPS (European Physical Society)

#### 7.5 Membership in National Institutions/Committees

- Igor Jamnický - Member of the Organizing Committee of 19<sup>th</sup> APCOM conference 2013
- Peter Bury - Member of the Slovak Physical Society Council  
- Member of the Scientific Committee of 19th Conference APCOM 2013  
- Member of the Field Commission Solid State Physics and Acoustics at FEI STU Bratislava  
- Member of the Scientific Committee of ADEPT 2013  
- Member of the Scientific Committee of 20th Conference of Slovak physicists, Bratislava 2013
- Dušan Pudiš - Member of the Programme Committee of 19th Conf. APCOM 2013  
- Chair of the Organizing Committee of the 1. Conference ADEPT 2013  
- Member of the Programme Committee of ELEKTRO 2013
- Ivan Melo - National coordinator of the 9th International Masterclasses in Particle Physics for high school students
- Peter Hockicko - Member of the Scientific Committee of the 8th International Conference Material - Acoustics Place 2013, Zvolen

- Norbert Tarjányi - Member of a committee of the Slovak Acoustic Society at SAS  
 - Member of the Slovak Physical Society

## 7.6 Membership in University Boards

- Dušan Pudiš - member of the Commission for the field 5.2.12 Electrotechnologies and materials  
 - Member of Scientific Council of EF ŽU  
 - Secretary of the Academic Senate of EF ŽU  
 - Member of the Executive Council of the KAP club (alumni and friends of University of Žilina)
- Igor Jamnický - Member of the Commission for the field 5.2.12 Electrotechnologies and materials
- Peter Bury - Chair of the Commission for the field 5.2.12 Electrotechnologies and materials, EF ŽU  
 - Member of Academic Senate of EF ŽU  
 - Member of Scientific Council EF ŽU
- Daniel Káčik - Member of Academic Senate of EF ŽU
- Marián Janek - Member of the Organizing Committee of ELEKTRO 2014

## 8 Publications

### Lecture Notes

- [1] MARTINČEK, Ivan – PUDIŠ, Dušan: Optical fibres for special applications (Optické vlákna pre špeciálne aplikácie), EDIS-publisher of University of Žilina, 2013, 7.36AH, code BCI, ISBN: 978-80-554-0707-4.

### Current Content Journals

- [2] KÚDELČÍK, Jozef,- BURY, Peter – DRGA, Jozef – KOPČANSKÝ, Peter – ZÁVIŠOVÁ, Vlasta – TIMKO, Milan: *Structure of transformer oil-based magnetic fluids studied using acoustic spectroscopy*, Journal of Magnetism and Magnetic Materials Vol. 326 Iss. 1 (2013) 75-80, ISSN 0304-8853
- [3] HOCKICKO, Peter – BURY, Peter – MUNOZ Francisco: *Investigation of relaxation and transport processes in LIPO(N) glasses*, Journal of Non-Crystalline Solids, Vol. 363, (2013) 140-146 ISSN 0022-3093
- [4] BURY, Peter – MATSUMOTO, Taketoshi – BELLAN, Ivan – JANEK, Marián – KOBAYASHI, Hikaru: *Acoustic spectroscopy and electrical characterization of Si/NaO-SiO<sub>2</sub>/HfO<sub>2</sub> structures*, Applied Surface Science Vol. 269 (2013) 50-54 ISSN 0169-4332
- [5] KUBICOVÁ, Ivana – PUDIŠ, Dušan – ŠKRINIAROVÁ, Jaroslava – KOVÁČ, Jaroslav – KOVÁČ, Jaroslav Jr. – JAKABOVIČ, Ján – ŠUŠLIK, Ľuboš – NOVÁK, Jozef – KUZMA, Anton: *2D irregular structure in the LED surface patterned by NSOM lithography*, Applied Surface Science Vol. 269 (2013) 116-119 ISSN 0169-4332
- [6] PUDIŠ, Dušan – ŠUŠLIK, Ľuboš – ŠKRINIAROVÁ, Jaroslava – KOVÁČ, Jaroslav, KOVÁČ, Jaroslav, Jr. – KUBICOVÁ, Ivana, MARTINČEK, Ivan – HŠČÍK, Štefan –

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- [7] KUBICOVÁ, Ivana – PUDIŠ, Dušan – ŠUŠLIK, Ľuboš – ŠKRINIAROVÁ, Jaroslava: *Spatial resolution of apertureless metal-coated fiber tip for NSOM lithography determined by tip-to-tip scan*, Optika 124 (2013) 1971-1973 ISSN 0030-4026
- [8] HALANDA, Juraj – ZÁHORANOVÁ, Anna – KÚDELČÍK, Jozef – ČERNÁK, Mirko: *Chemical aspects of streamer mechanism for negative corona discharges*, Chemické listy 106, (2012) pp. 1447-1449 ISSN 0009-2770
- [9] TATAR, Peter – KÁČIK, Daniel: *Modeling of two core photonic crystal fiber modal interferometer for refractive index measurement by equalization wavelength*, Optical Fiber Technology 19 (2013) pp.330-334 ISSN 1068-5200
- [10] GINTNER, Mikuláš – JURÁŇ, Josef: *The vector resonance triplet with the direct coupling to the third quark generation*, The European Physical Journal C (2013) 73:2577 (2013) ISSN 1434-6044 (print), 1434-6052 (online)
- [11] MARTINČEK, Ivan – PUDIŠ, Dušan – GAŠO, Peter: *Fabrication and Optical Characterization of Strain Variable PDMS Biconal Optical Fiber Taper*, IEEE Photonics technology letters, Vol. 25, No. 21, (2013) ISSN 1041-1135
- [12] JANEK, Marián – et.al: *Angular distributions of the vector  $A_y$  and tensor  $A_{yy}, A_{xxx}, A_{xz}$  analyzing powers in the  $d\alpha \rightarrow {}^3\text{He}$  reaction at 200 MeV*, Physical Review C 87, 051001 (2013) ISSN 0556-2813

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- [12] KÚDELČÍK, Jozef – BURY, Peter – DRGA, Jozef – KOPČANSKÝ, Peter – ZÁVIŠOVÁ, Vlasta – TIMKO, Milan: *Comparison of theories of anisotropy in transformer oil-based magnetic fluids*, Advance in Electrical and Electronic Engineering, Vol. 11, No 2 (2013) ISSN 1336-1376 pp. 147-155
- [13] JANEK, Marián – TRPIŠOVÁ, Beáta, et. al: *Izučenie reakcie  $d\alpha \rightarrow p\alpha$  na vnútrejnej mišeni Nuklotrona pri energii dejtróna 500 MeV*, Preprint SÚJV (2013)
- [14] JANEK, Marián – et.al: *The cross section in  $d\alpha$  – elastic scattering at the energies of 500, 700 and 880 MeV obtained at the internal target station of Nuclotron*, Particles and Nuclei, Letters, Vol. 10, No. 3(180), Dubna, Rusko (2013) C.389-396, ISSN 1814-5957
- [15] KÚDELČÍK, Jozef – BURY, Peter – KOPČANSKÝ, Peter – TIMKO, Milan – ZÁVIŠOVÁ, Vlasta: *Acoustic properties of magnetic fluids based on transformer oil under magnetic field*, Journal of ELECTRICAL ENGINEERING, Vol. 64, No. 6 (2013), pp. 381-385 ISSN 1335-3632
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- [26] KÚDELČÍK, Jozef – BURY, Peter – ŠÖBEK, Milan: *Acoustic investigation of magnetic fluid based on transformer oil TECHNOL*, Diagnostika 2013: conference on diagnostics in electrical engineering CDEE 2013 Plzeň (2013) p. 136-139 ISBN 978-80-261-0210-6

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- [36] TATAR, Peter – KÁČIK, Daniel – MARTINČEK, Ivan – SCHUSTER, Kay: *The temperature sensor based on opto-fluid fiber intermodal interferometer*, Proceedings of ADEPT, 1<sup>st</sup> International Conference on Advances in electronic and photonic technologies, Nový Smokovec, Vysoké Tatry, (2013), pp. 80-84 ISBN 978-80-554-0689-3
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