

DEPARTMENT OF PHYSICS

1. General Information

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, training them in applying the principles of physics to various engineering problems as well as giving the students a review of modern physics.

The department is divided into three sections according to their research and educational specialisation and an additional one, which has special tasks to support the research activities of the Department. The staff consists of 1 professor, 8 associate professors, 13 senior lecturers, 3 lecturers, 2 research fellows, 8 technicians and administrative support.

Traditionally, the research carried out at the department is mostly concerned with the utilization of ultrasonic methods for the investigation of condensed matter. Currently a wide range of ultrasonic techniques is used to investigate semiconductors, metals and ferroelectric materials as well as new ultrasonic techniques are developed. The Department also contains one group working on optical fibres, which are used in communication links, and some research work has been done on the x-ray diffraction analysis of thin layers. In last years the research programme was extended to theoretical high-energy physics phenomenology of strong electroweak symmetry breaking.

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.

In accordance with their qualifications the members of the staff participate in different educational, scientific and management activities beyond the framework of the department and the University, especially on various scientific boards of both domestic and international institutions. There are also many activities directed to advancing the education of physics teachers working in secondary schools and to the organisation of Physics Olympiads in order to prepare young people for national and international competitions.

2. Staff of the Department

Head of the Department	:	Igor Jamnický, Assoc. Prof. PhD.
Subhead of the Department	:	Peter Bury, Prof. PhD.
Secretary for Education	:	Ľibor Musil, PhD.
Administrative support	:	Anna Chasníková, Naďa Remencová, Juraj Remenec, Viliam Tavač,

2.1. Sections of the Department:

2.1.1 Section of General Physics

Head of the section	:	Juraj Bracíník
Associate professor	:	Juraj Bracíník,
Research fellows	:	Mikuláš Gintner, Ivan Melo
Senior lecturers	:	Anna Bracíníková, Milan Krkoška, Ivan Pavlus, Jozef Štelina, Beáta Trpišová, Igor Varga, Pavel Virdzek
Lecturer	:	Gabriela Tarjániová

2.1.2. Section of Applied Physics

Head of the section	:	Július Štelina
Professor	:	Peter Bury
Associate professors	:	Quido Jackuliak, Igor Jamnický, Jozef Kejst, Sofia Slabeyciusová, Július Štelina, Ivan Turek, Drahošlav Vajda

Department of Physics

Senior lecturers	:	Ivan Bellan, Peter Hockicko, Daniel Káčik, Jaroslav Kovár, Ctibor Musil, Ivan Martinček, Dušan Pudiš, Peter Sidor, Ladislav Vikisály
Lecturers	:	Andrea Hanuliaková, Vladimír Žucha

2.1.3. Section for Research Activities Support

Head of the section	:	Jaroslav Kovár
Technical staff	:	František Černobila, Ján Dávik, Milan Obrcian, Ľudovít Trháč

2.1.4. Postgraduate Students

:	Ivan Bellan, Peter Hockicko, Gabriela Tarjányiová, Pavol Virdzek, Vladimír Žucha
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3. Teaching

3.1. Courses in Bachelor and Master Degree Programmes

		Lessons-Seminars-Lab.exercises		
Code	Title	Semester	hours/week	Teachers
Courses for the Faculty of Electrical Engineering				
31070	Physics I	2	3 - 2 - 1	Bury, Jamnický
31047	Physics II	3	4 - 1 - 1	Bury, Jamnický
31059	Semiconductor Physics	4	4 - 0 - 0	Bracínik
31101	Introduction to Physics	1	2 - 0 - 0	Pavlus
31023	Computer Modelling of the Real Processes	3	1 - 0 - 2	Jamnický, Pudiš
31081	Seminar on Semiconductors	4	0 - 2 - 0	Pudiš
32236	Optoelectronics	5	2 - 0 - 2	Štelina
31688	Principles of Modern Acoustics	7	3 - 1 - 0	Vajda
32201	Physics	1	3 - 2 - 1	Musil
31007	Analysis of Quantities and Processes	2	0 - 2 - 0	Pavlus
31099	Wave processes	4	2 - 2 - 0	Čáp
32008	Seminar on Physics	1	0 - 2 - 0	Štrbová
32002	Electrophysics	1	3 - 2 - 1	Musil
Courses of the Faculty of Mechanical Engineering				
21950	Introduction to Physics	1	1 - 1 - 0	Jackuliak
21008	Physics I	2	3 - 2 - 0	Vajda, Kejst Jackuliak
21013	Physics II	3	2 - 0 - 2	Vajda, Slabeyciusová
22002	Technical Physics	2	2 - 2 - 0	Vikisály
26007	Physics I	2	20 - 6 - 0	Martinček
26011	Physics II	3	24 - 6 - 0	Martinček
Courses of the Faculty of Civil Engineering				
42060	Physics	1	2 - 2 - 0	Štelina
41011	Physics	2	2 - 1 - 1	Štelina
42351	Introduction to physics	1	0 - 2 - 0	Štelina
42804	Physics – optics	2	2 - 1 - 0	Štelina
42016	Chapters of Physics	2	0 - 2 - 0	Kovár

EXTERNAL STUDY

46008	Physics II.	2	10 - 6 - 0	Musil
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Courses of the Faculty of Operation and Economics of Transport and Communication

11010	Physics	2	3 - 1 - 2	Martinček, Pavlus, Kejst
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External Study

16032	Physics	1	16 - 0 - 0	Bury
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Courses of the Faculty of Management Science and Informatics

P403	Fundamentals of Physics	3	3 - 1 - 1	Bracíník
P412	Physics II	4	4 - 1 - 1	Kejst

Courses of the Faculty of Special Engineering

91101	Physics	1	hours/sem 2 - 6 - 12	Kovár
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EXTERNAL STUDY

91101	Physics	1	18 - 0 - 0	Kovár
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Courses of the Faculty of Natural Sciences

81089	Theoretical Mechanics	3	1 - 1 - 0	Bracíník
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4. Research Projects

4.1. Internal Projects

Title: Investigation of Nonlinear Optical Phenomena in Condensed Matter)

Coordinator: Július Štelina

Cooperators: Juraj Bracíník, Jozef Kejst, Quido Jackuliak, Ctibor Musil, Norbert Tarjanyi, Žucha
Vladimír

Title: Investigation of Ways to Utilize Intermodal Interference for the Determination of the Optical Fiber Parameters

Coordinator: Ivan Martinček

Cooperator: Ivan Turek, Daniel Káčik

Title: Study of Physical Properties of Materials Perspective for Electrotechnics Using Acoustic Methods

Coordinator: Peter Bury

Cooperators: Drahoslav Vajda, Igor Jamnický, Peter Hockicko, Jaroslav Kovár, Ivan Bellan

Title: Study of electroweak symmetry breaking

Coordinator: Ivan Melo

Cooperator: Mikuláš Gintner

4.2. Research Projects funded by the Science & Education Grant Agency of the Slovak Republic

Title: Sensitivity of Future Coliders to $VVtt$ vertex and the Role of the Top Quark in the Mechanism of Electroweak Symmetry Breaking (Grant VEGA 1/0258/03)

Coordinator: Ivan Melo

Cooperator: Mikuláš Gintner

Title: Examination of Self – Diffraction of Light in Magnetic Fluids. (Project is a part of the programme: Study of Physical Parameters of Complex Systems with Fine Magnetic Particles) (Grant VEGA 2/7020/20)

Coordinator: Július Štelina

Cooperators: Ctibor Musil

5. Cooperation

5.1. Cooperation in Slovakia:

- Department of Physics, Faculty of Electrical Engineering and Information Technology, Slovak University of Technology in Bratislava
- Departments of Faculty of Mathematics, Physics and Informatics, Comenius University in Bratislava
- Department of Physical Engineering, Faculty of Industrial Technology, Trenčín University, Púchov
- Department of Physics, Military Academy, Liptovský Mikuláš
- ATLAS group, Institute of Experimental Physics, Slovak Academy of Science, Košice,
- Virtual Collaboration, University of P.J. Šafarik, Košice
- Institute of Experimental Physics, Slovak Academy of Science, Košice,
- Volkswagen Slovakia, Bratislava
- Welding Research Institute, Bratislava

5.2. International cooperation

- Institute of Biochemical Physics, RAS, Moscow
- Škoda – Research, Prague
- Department of Physics, Nottingham University
- ÚRE Prague
- Institute of Experimental Physics Science, Czech Academy, Prague
- ATLAS collaboration, CERN, Switzerland

5.2.1. Visits to Foreign Institutions:

- Ivan Melo - Vienna University, Austria, 1 day, Nov 29

- Mikuláš Gintner - Vienna University, Austria, 1 day, Nov 29
- J. Bracíník, J. Kejst - Faculty of Electrical Engineering, ČVUT Praha, 2 days, Sep 29-30
- I. Martinček, D. Káčik: - ČVUT Praha, 2 days, Oct 21-22

6. Other activities

6.1 Conferences organized by the Department

- 9th International Workshop on Applied Phys. Of Condensed Matter (APCOM O3), June 11-13.2003, Malá Lučivná, Slovak Republic

6.2 Seminars

- JSMF (Unity of Slovak Mathematicians and Physicists) and KF (Dept. of Physics) seminar: RNDr. Radoslav Bučík (Technical University Zvolen) „Gamma Radiation at Low Polar Orbit“, 30. 6. 2003
- JSMF/KF seminar: prof. RNDr. Július Krempaský, DrSc. „Modern trends in Physics“, 21. 11. 2003
- VRVS videoconference seminar from KTF FMFI UK, Bratislava: V. Černý „Pentaquarks“, 21.10.2003
- VRVS videoconference seminar from PF UPJŠ Košice: Dr. Oxana Smirnova „Introduction to the GRID“, 28.10.2003
- VRVS videoconference seminar from FU SAV, Bratislava: Dr. Ľ. Martinovič „Spontaneous Symmetry Breaking in Scalar Field Theory at the Light Front“, 10.11. 2003
- VRVS videoconference seminar from KTF FMFI UK, Bratislava: prof. M.Noga „Nobel Prizes for Physics 2003“, 11. 12. 2003
- VRVS broadcast from the conference Týždeň absolventov matfyzu (TAM 2003) at FMFI UK Bratislava; P. Langfelder (University of Waterloo, Canada) „Superstrings – Theory of everything ?“ a M. Franz (University of British Columbia, Canada) „Schmutz physik or Glamour and the Other Side of Condensed Matter Physics“, 16. – 17. 12. 2003
- Small seminars are also organized within acoustical (Doc. Vajda) and optical (Doc. Turek) groups at the Dept.

6.3 Activities of Virtual Collaboration

- VRVS Videoconference Broadcast for the whole University of Žilina from Workshop at University of Economics, Bratislava: „Further Education of University Management in Connection with Slovakia joining EU“, 3.6. 2003
- VRVS broadcast from Workshop IT Summit 2003, Bratislava, 26. 11. 2003
- Information Day of Virtual Collaboration at University of Žilina, 2. 12. 2003
- Live Broadcast from University of Žilina to World Summit on Information Society, CERN (Geneva), 11. 12. 2003

7. Publications

Chapters in monographies:

- [1] I. Turek, I. Martinček, D. Káčik, P. Peterka, K. Grondžák: Intermodal interference as a tool for optical fibre diagnostics, *Recent. Res. Devel. Optical Engg.*, 5 (2003), 61-81.

Journals:

- [2] Prokhorov M., Blank V.D., Dubitsky G.A., Berezina S., Levin V.M.: Elastic and microstructural properties Of C-60- and C-70-based polymerized fullerites exposed to high pressure (15 GPa) and elevated temperatures. J PHYS-CONDENS MAT 14 (44): 11305-11310 NOV 11 2002 (not reported in Annual Report 2002)
- [3] P. Bury, P. Hockicko, V. W. Rampton: Acoustoelectric Investigation of Optically Induced Deep centers in GaAs/AlGaAs Heterostructures, Acta Physica Slovaca, Vol. 53, No.3, 189-194.
- [4] P. Bury, I. Jamnický, P. Hockicko: Acoustoelectric Investigation of Deep Centers in Bulk and Multilayered Semiconductors, Communications, Scientific Letters of the University of Žilina, 2/2003, p. 5-13.
- [5] P. Bury, Š. Barta, V. Magula, V. Slugen, T. Šmida: Ultrasonic Investigation of Plastically Deformed Steel-Contribution to Analysis of Degradation Influence, Communications, Scientific Letters of the University of Žilina, 2/2003, p. 41-43.
- [6] P. Bury, P. Hockicko, M. Jamnický, I. Jamnický: Om the Relation between Electrical and Acoustical Properties of Ion Conductive Glasses, Adv. Electrical and Electronic Engineering, 2(2003), No 3-4 (in press).
- [7] Turek, D. Káčik, I. Martinček: To the influence of material dispersion on the intermodal interference in optical fibres, Komunikácie 2/2003, 14-17.
- [8] Pudiš, D., Kováč, J. jr., Kováč, J., Jakabovič, J.: Semiconductor lasers based on quantum well structures, Komunikácie 2/2003, 29-32.
- [9] Kováč, J., Kováč, J. jr., Pudiš, D., Jakabovič, J., Vincze, A., Gottschalch, V., Benndorf, G., Rheinländer, B., Schwabe, R.: Stimulated red emission from InAs monolayers embedded in the active region of $\text{Al}_x\text{Ga}_{1-x}\text{As}$ barriers, Laser Physics, Vol.13, No.2, 2003, pp.240-244
- [10] Q. Jackuliak, P. Šutta: Macro and microtensions in polycrystalline thin Si layers deposited on ceramic substrates, Advances in Electrical and Electronic Engineering, Vol. 2/2003, No. 2, 20-25.
- [11] Šutta P., Jackuliak Q. : X-ray Diffraction line Profile Analysis of Strongly Textured Thin Films of ZnO, Komunikácie/Communications, 2/2003, 37-40.
- [12] J. Štelina, C. Musil: The Study of Kinetics Colloidal particles in magnetic Fluids Using Diffraction Effect on an Optical grating Created by Intersecting Laser Beams, Komunikácie/Communications, 2/2003, 22-23.
- [13] J. Braciník, J.Kejst: Acoustic Technique for Study of the Surface Nonequilibrium Processes in Piezoelectric Semiconductors, Acta Acoustica/Acoustica 89 (2003) 258-262.
- [14] Turek, J. Štelina, C. Musil, P. Kopčanský, M. Timko, M. Koneracká, J. Potočanová, A. Juríková, L. Tomčo: Light Induced Thermodiffusion in Magnetic Fluids, 5th International Pamír Conference, Rematuelle, France Sept 16.-20. 2002, received March 20, 2003 in a Spetial Revue of the International Journal Magnetohydrodynamics Vol. 39, No. 3, 375-384, 2003.
- [15] I. Turek, M.Dado, *10 years of optical group in Žilina*, Jemná mechanika a optika, 2003, No. 11/12 p. 344.
- [16] S. Berezina, O. Kolosov, J. Slabeycius: Investigation of Local Mechanical Properties of Al-Cu-Li Alloys by Acoustic Microscope, Komunikácie 2/2003, 26 -28.
- [17] S. Berezina, P.V. Zinin, D. Schneider, D. Fei, and D.A. Rebinsky Combining Brillouin Spectroscopy and Laser-SAW Technique for Elastic Property Characterization of Thick DLC Films. Ultrasonics. (in press).

Conference Proceedings:

- [18] P. Bury, P. Hockicko, M. Jamnický, I. Jamnický: Study of Mixed Cation Effect in Ion Conductivity Glasses Using Electrical Conductivity Spectra, Proceedings of the 9th Int. Workshop on Applied Physics of Condensed Matter, June 11-13, 2003, p. 174-178.
- [19] P. Bury, P. Hockicko, M. Jamnický, I. Jamnický: Contribution of Acoustic Spectroscopy to Understanding of Transport Mechanisms in Fast Ion Conductive Glasses, proceedings of the 7th Int. Colloquium ACOUSTIC03, Zvolen, Sept. 4.-5., 2003, p. 15-18.
- [20] D.Vajda: Investigation of Relaxation Time of Polarization in KDP Type Crystals by Ultrasonic Waves, proceedings of the 7th Int. Colloquium ACOUSTIC03, Zvolen, Sept. 4.-5., 2003, , pp.55-57
- [21] D. Káčik, I. Turek, I. Martinček, P. Peterka: The Study of an experimental twin core optical fibre behavior, Optické komunikace 2003 – proceedings, 71-76, Praha 2003.

- [22] I. Melo, M. Gintner: „Production of new resonances from electroweak sector at future e+e-Colliders“, Proceedings of the 13th conference of Slovak physicists, Smolenice, 25.-28.8. 2003 (will be published).
- [23] I. Melo, M. Gintner: Proceedings of the 8th Adriatic meeting Conference, Dubrovnik, published as Particle Physics in the New Millenium, Springer Lecture Notes in Physics 2003, CD-ROM.
- [24] J. Štelina, C. Musil, J. Braciník, M. Timko, P. Kopčanský, M. Konarecká, : Temperature Dependence of the relaxation time of vanishing of the diffraction grating created in the sample of magnetic fluid, 13th conference of Slovak physicists, Smolenice, 25.-28.8. 2003.
- [25] A. Braciníková, J. Braciník, J. Kejst: Contactless Photoacoustic Measurement of the Thermal Conductivity of the Semiconductor thin Plates with Use of the Double Photoacoustic Cell, Proceedings of the 9th International Workshop on Applied Phys. of Condensed Matter, June 11-13 2003, Malá Lučivná, Slovak Republic, 245-249.
- [26] Q. Jackuliak, P. Šutta, V. Žucha, I. Novotný, V. Tvarožek: Influence of technology preparation and substrates on microstructural properties of ZnO thin films. Proceedings of the 9th International workshop on APCOM, M. Lučivná, Slovakia, June 11-13, 2003, 11-15.
- [27] J. Štelina, C. Musil, J. Braciník: Temperature Dependence of the Kinetics of Colloidal Particles Disperes in Fluids, Proceedings of the International Workshop on Applied Physics of Condensed Matter, June 11.-13. 2003, 250-253.
- [28] I. Turek, N. Tarjányi: The Photorefractive Effect and LiNbO3 Band Structure, APCOM03, June 11-13 2003, Malá Lučivná, Slovakia.
- [29] Pudiš, D., Kováč, J. jr., Kováč, J.: Hole subbands in InAs/Al_xGa_{1-x}As quantum well structures, In Proceedings of the 9th International Workshop on Applied physics of condensed matter, 2003, pp.80-83
- [30] K. Grondžák, I. Melo and Virtual Collaboration: Virtual Collaboration and VRVS videoconferences in Slovakia, Proceedings of E-learn 2003 conference, Žilina, 4.-5. 2. 2003, p. 165.
- [31] F. Franko, M. Gintner, I. Melo and Virtual Collaboration: „First experience with preparation of webuniversity“, Proceedings from International conf. UNINFOS (Univ. inf. systémy) 2003, Nitra, 3.-5.9. 2003, ISBN 80-8069-241-6, p. 86-89.
- [32] F. Franko, M. Gintner, I. Melo and Virtual Collaboration: „Contribution to the use of ICT in Physics Education“, Proceedings of the 13th Conference of slovak physicists, Smolenice, 25. – 28.8. 2003.
- [33] I. Turek: „10 years of the optical group in Žilina“, 13th Conference of Slovak physicists, Smolenice, August 2003.
- [34] P. V. Zinin, S. Berezina, D. Fei, D. A Rebinsky, R. M. Lemor, E. C. Weiss, C. Arnaud, W. Arnold, B. Koehler “Detection and Localization of Subsurface Defects in DLC Films by Acoustic Microscopy” in M. Levy, S. C. Scheider and B. R. McAvoy eds., 2003 *IEEE Ultrasonic Symposium*, IEEE, New York in press (2004).
- [35] I. Turek, *Physics is (should be) part of culture*, Invited Lecture at the 13th Conference of Slovak physicists, Smolenice, August 2003. (to be published)

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