

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, 7 associate professors, 18 senior lecturers, 1 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, Mária Richterová, 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	:	Igor Jamnický, Jozef Kejst, Sofia Slabeyciusová, Július Štelina, Ivan Turek, Drahoslav Vajda

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

2.1.3. Section for Research Activities Support

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

2.1.4. Postgraduate Students

: Ivan Bellan, Peter Hockicko, Andrea Hanuliaková, Gabriela Tarjániová, Pavol Virdzek, Vladimír Žucha

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	Bracíník
31101	Introduction to Physics	1	2 - 0 - 0	Káčik
31023	Computer Modelling of the Real Processes	3	1 - 0 - 2	Jamnický
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	Kejst
31099	Wave processes	4	2 - 2 - 0	Kejst
32008	Seminar on Physics	1	0 - 2 - 0	Bracíníková
31080	Seminar on Physics II	3	0 - 2 - 0	Bracíník
32002	Electrophysics	1	3 - 2 - 1	Musil
	Electrophysics (external Bch.)	1	14 - 8 - 4	Bury
	Seminar on Physics	1	0 - 8 - 0	Hockicko
	Fibre Optics			Káčik
Courses of the Faculty of Mechanical Engineering				
21950	Introduction to Physics	1	1 - 1 - 0	Trpišová
21008	Physics I	2	3 - 2 - 0	Vajda, Slabeyciusová
21013	Physics II	3	2 - 0 - 2	Vajda, Trpišová
22002	Technical Physics	2	2 - 2 - 0	Trpišová
26007	Physics I	2	20 - 6 - 0	Martinček
21013	Physics II	3	24 - 6 - 0	Martinček
21685	Technical Optics	10	2 - 1 - 1	Martinček
Courses of the Faculty of Civil Engineering				
42060	Physics	1	2 - 2 - 0	Štelina
42010	Physics	2	2 - 1 - 1	Štelina
42063	Physics – optics	1	2 - 1 - 0	Štelina
42361	Seminar on Physics	1	0 - 2 - 0	Štelina
42016	Chapters of Physics	2	0 - 2 - 0	Kovár
46009	Physics	2	10 - 6 - 0	Musil

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

12005	Physics	1	2 - 1 - 1	Martinček, Pudiš, Kejst
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External Study

			hours/sem.	
16006	Physics	1	16 - 0 - 0	Bury

Courses of the Faculty of Management Science and Informatics

P314	Fundamentals of Physics	3	3 - 1 - 1	Bracíník
P314	Fundamentals of Physics	1	3 - 1 - 1	Vikisaly

Courses of the Faculty of Special Engineering

			hours/sem	
91101	Physics	1	2 - 6 - 12	Kovár
91101	Physics	1	18 - 0 - 0	Kovár
	Optoelectronics	7	2 - 0 - 1	Štelina

Courses of the Faculty of Natural Sciences

81089	Theoretical Mechanics	4	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, Žucha
Vladimír, Pavol Virdzek

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

Coordinator: Ivan Martinček

Cooperator: Ivan Turek, Daniel Káčik, Dušan Pudiš, Norbert Tarjanyi

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: Mikuláš Gintner

Cooperator: Ivan Melo, Beata Trpišová

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

Title: Sensitivity of Future Colliders 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, Juraj Bracínik

4.3. Program Phare of Cross-border Cooperation between SR and PL

Tourist Information System of the Euroregion
(SR 01.03-0011)
Coordinator: doc. Ing. Karol Matiaško, PhD. (FRI University of Zilina)
Cooperator: Ing. Igor Varga

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. Šafárik, Košice
- Dept. of Magnetism, Institute of Experimental Physics, Slovak Academy of Science, Košice
- Volkswagen Slovakia, Bratislava
- Welding Research Institute, Bratislava
- Department of Ceramics, Glass and Cement, Faculty Chemical and Food Technology, Slovak University of Technology in Bratislava
- Výskumný ústav zvaračský Bratislava
- Dept. of Microelectronics, FEI STU Bratislava
- International Laser Center, 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
- Centaurus Technologies (University of Sydney)

5.3. Visits to Foreign Institutions:

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| • D. Káčik: URE CAV Prague | 3 days |
| • P. Bury: Ioffe Institute, St. Petterburgh, Rusko | 7 days |
| • M. Gintner, I. Melo, CERN, Ženeva, Švajčiarsko | 10 days |
| • M. Gintner, I. Melo, Veľká Británia, University of Durham | 5 days |
| • S.Slabeyciusová, Taliansko, University „La Sapienza“, Rim | 28 days |
| • S.Slabeyciusová, USA, University of Hawaii at Manoa, Honolulu | 40 days |

6. Other activities

6.1 Seminars

- Creation of modern www pages (Doc. Ing. Igor Jamnický, CSc., 10. 2. 2004, KF)
- Contribution to education of physicists in preschool age (Doc. RNDr. Ivan Turek, CSc., 17. 2. 2004, JSMF/KF)
- Twin core optic fibres (Ing. Daniel Káčik, 2. 3. 2004, JSMF/KF)
- The scanning of near and far field of semiconductor lasers (Ing. Dušan Pudiš, PhD., 9. 3. 2004, JSMF/KF)
- Method of determination of Soret constant in colloid liquids (Doc. Ing. Július Štelina, CSc., Ing. Ctibor Musil, CSc., 23. 3. 2004, JSMF/KF)
- Generation of higher diffractive orders on photorefractive recording of optical field with harmonic dependence on coordinate (Ing. Norbert Tarjányi, 6. 4. 2004, JSMF/KF)
- Quantum Chromodynamics (RNDr. Ivan Melo, PhD., 30. 6. 2004, VRVS/JSMF/KF)
- Diffusion in LiNbO_3 (Doc. RNDr. Ivan Turek, CSc., 23. 9. 2004, JSMF/KF)
- „HASYLAB“, VRVS seminar watched at KF EF ŽU, 27. 9. 2004 (Ing. Karel Saksl, PhD., UEF SAV Košice)
- Small seminars are also organized within acoustical (Doc. Vajda) and optical (Doc. Turek) groups at the Dept.

6.2 Activities of Virtual Collaboration

- All-day workshop „Important issues concerning management of universities in SR“, VRVS broadcast for University of Zilina, 17. 5. 2004 (Organizer: University of Economics, Bratislava)
- Seminar „Electricity around us“, VRVS broadcast for high schools in Zilina, 28.5. 2004 (Organizer: FMFI UK Bratislava)
- Seminar „All about physics of CD's“, VRVS broadcast for high schools in Zilina, 25.6. 2004 (Organizer: FMFI UK Bratislava)
- Seminar „Quantum Chromodynamics“, VRVS broadcast from Zilina to three Slovak universities (Organizer: Ivan Melo)
- Workshop „How to find sponsors for physically handicapped children“, Slovakia-wide VRVS videoconference for parents of handicapped children, 22.10.2004 (Organizer: Infodom Bratislava)
- „Virtual Collaboration – Status Quo“ (Ivan Melo, Contribution to ICETA 2004 ECHO Workshop, Ceske Budejovice – broadcast via VRVS from Zilina), 30.11.2004

6.3 Awards

- Award of the Minister of Education SR for Science and Technology for 2004: Ivan Turek
- Honorary award „Scientist of the year 2003 in SR“ : Ivan Turek
- Werner von Siemens „Excellence Award 2004“ for Ph.D. work: Daniel Kacik
- Award for 3rd place at the competition „e-learning in practice“ (category „support material for on-line education“): Peter Hockicko

7. Publications

Journals:

- [1] N. Tarjányi, I. Turek : *The Photorefractive Effect In LiNbO₃ Crystals With Various Dopants*, acta physica slovacica vol. 54 No. 5, 433 – 445
- [2] Turek, J. Braciník, C. Musil, J. Štelina, P. Kopčanský, M. Timko, M. Hnatič, M. Repašan, I. Potočová, L. Vékáš, D. Bica : *Light induced structuralization in magnetic fluids with negative Soret constant*, CZECHOSLOVAK JOURNAL OF PHYSICS 54: A273-A276 Suppl. A 2004
- [3] J. Štelina, J. Braciník, C. Musil, P. Kopčanský, M. Timko : *The determination of the hydrodynamic diameter of magnetic particles using FRS experiment*, accepted for publication in J. Magn. Mater.
- [4] P. Bury, P. Hockicko, S. Jurečka, M. Jamnický : *Analysis of acoustic attenuation spectra due to ion transport processes in glassy electrolytes*, Phys. stat. sol (c) **1**, No. 11, (2004) 2888-2891
- [5] J. Kováč, J. Kvietková, J. Kováč jr., J. Chovan, S. Hardt, B. Rheinländer, D. Pudiš : *Edge-emitting laser including InAs/GaAs monolayer active region embedded in AlAs/AlGaAs vertical resonant cavity*, Physics of Lasers, Vol.14, No.2, pp1-6
- [6] Martinček, D. Káčik, I. Turek, P. Peterka : *The determination of the refractive index profile in α -profile optical fibres by intermodal interference investigation*, Optik **15** (2004) 86
- [7] D. Káčik, I. Turek, I. Martinček, Canning, Issa, Lyytikainen : *Intermodal interference in a photonic crystal fibre*, OPTICS EXPRESS, **12**, (2004) ,3465 – 3470
- [8] S. Berezina, P. V. Zinin, D. Schneider, D. Fei, D. A. Rebinsky : *Combining Brillouin spectroscopy and laser-SAW technique for elastic property characterization of thick DLC films*, Ultrasonics Volume 43, Issue 2, December 2004, Pages 87 – 93
- [9] P. V. Zinin, S. Berezina, D. Fei, D. A. Rebinsky, R. M. Lemor, E. C. Weiss, A. Caron, W. Arnold, B. Koehler : *Detection and Localization of Subsurface Defects in DLC Films by Acoustic Microscopy* , in D.E.Yuhas ed., *IEEE Ultrasonic Symposium*, IEEE, New York, (2004) pp. 881-884.
- [10] P. Bury, M. Jamnický, P. Hockicko, I. Jamnický: *Transport Mechanismus Study of Glassy Electrolytes Using Acoustic Attenuation and Conductivity Spectroscopy*, Glastech. Ber. Glass Sci. Technol. Vol. 77 C (2004) 354 - 358. ISSN 0946-7475
- [11] P. Zinin, D. Fei, D. Rebinsky, M. Manghnani, S. Berezina, R. Lemor, C. Blasé, A. Caron, D. Schneider, K. Kraemer, *Acoustic microscopy, Brillouin scattering and Laser-SAW technique for defect characterization in DLC films*, in W. Arnold and S. Hirsekorn eds. *Acoustical Imaging*, Kluwer Publ., New York, Vol. 27. (2004) pp. 221-228.
- [12] N. Tarjányi, I. Turek : *Interference imaging of refractive index distribution in thin samples*, Advances in Electrical and Electronic Engineering, Vol. 3, No. 2 (2004) 257
- [13] N. Tarjányi, I. Turek : *The generation of higher order diffraction beams by photorefractive record of harmonic optical field*, Advances in Electrical and Electronic Engineering, Vol. 3, No. 2, (2004) 253
- [14] P. Hockicko, P. Bury, I. Jamnický, S. Jurečka, M. Jamnický : *Analysis of Acoustic Spectra Reflecting Ion Transport processes in Glassy Electrolytes*, Advances in Electrical and Electronic Engineering, Vol. 3, No. 2 (2004) 243-246
- [15] V. Žucha, Q. Jackuliak : *Voigt size-strain broadening of Pd thin films*, Advances in Electrical and Electronic Engineering, Vol. 3, No. 2, 302-304
- [16] D. Káčik, I. Turek, I. Martinček : *The influence of torsion on transmission function asymmetric twin core fibre*, Advances in Electrical and Electronic Engineering, Vol. 3, No. 2, (2004) 261
- [17] P. Zinin, S. Berezina, D. Schneider, D. Fei, D. A. Rebinsky, M. H. Manghnani, and S. Tkachev: *Brillouin scattering and laser-SAW technique for elastic property characterization of diamond-like*

carbon (DLC) films, in D.O. Thompson and D. E. Chimenti eds., *Review of Progress in Quantitative Nondestructive Evaluation*, **25**, AIP, Melville, in press, 2004.

- [18] M. Kocifaj, I. Martincek : *Propagation of microwaves trough atmospheric environment* Advances in Electrical and Electronic Engineering, Vol. 3, No. 2, (2004) 177-182

Conference Proceedings:

- [19] Turek, N. Tarjányi : *Interference imaging of photorefractive record in thin sample of LiNbO₃ crystal*, Proceedings of SPIE, XIVth Slovak-Czech-Polish optical conference "Wave and Quantum Aspects of Contemporary Optics", Sept. 2004, in press
- [20] P. Hockicko, *The Computer Supported Teaching and Studying Physics*, New Trends in Physics, NTF 2004, 11.november 2004, 296-299
- [21] P. Hockicko, P. Bury, I. Jamnický, S. Jurečka, M. Jamnický : *The Investigation of Transport Processes in Ion Conductive Glasses Using Acoustical and Electrical Spectroscopy*, New Trend in Physics, NTF 2004, 11. november 2004, 40-43
- [22] J. Štelina, J. Bracinik, C. Musil, P. Kopčanský; M. Timko; M. Koneracká : *Study of kinetics of nanoparticles in magnetic fluid*, 5th International Conference ELEKTRO 2004, 25. 5. 2004, 354-355 (in Slovak)
- [23] D. Bruncko, Gintner Mikuláš, Ivan Melo : *Vector resonances from strong electroweak symmetry breaking at e+e- colliders*, Proceedings of The Deep Inelastic Scattering International Conference 2004, 14-18. 4. 2004, in press
- [24] P. Bury, P. Hockicko, I. Jamnický, M. Jamnický : *What Do Acoustical Properties About The Mechanisms of Ion Transport Processes in Glassy Electrolytes*, Proceedings of the 18th International Congress on Acoustics, ICA 2004, Kyoto 2004, II – 1137-1140
- [25] M. Richterova, J. Tothova, V. Lisy : *Refraction index and the Kerr effect in droplet microemulsion*, Book of Abstrakt, p. 201, 13th International Laser Physics Workshop 2004, Trieste July 2004
- [26] D. Bruncko, M. Gintner, I. Melo : *Signatures of New rho-Resonances from Strong EWSB in e+e- -> nu nubar t tbar*, *On-line proceedings: Physics and Detectors for a Linear Collider, The 2nd Workshop of the ECFA "Physics and Detectors for a Linear Collider*, Study series Durham, Durham 2004, (<http://Conference.ippp.dur.ac.uk/cdsagenda/fullAgenda.php?ida=a041>)
- [27] J. Stelina, J. Bracinik, C. Musil : *Sign determination of the Soret coefficient from transport of nanoparticles in the periodic temperature field in the basic liquid*, 10th International Workshop on APCOM, 16. 6. 2004, 253-257
- [28] P. Hockicko, P. Bury, Jamnický I., Jurečka S.; Jamnický M., *Acoustic Spectroscopy Investigation of Ion Conductive Glasses of the System CuI-CuBr-Cu₂O-P₂O₅*, Proceedings of the 8th International Colloquium ACOUSTICS 04, 8. 9. 2004, 25-29
- [29] P. Hockicko, P. Bury, Jamnický I., Jurečka S.; Jamnický M. : *The Acoustic Attenuation Theoretical Models for the Ion Conductive Glasses*, Proceedings of the 10th International Workshop on Applied Physics of Condensed Matter, APCOM 04, Častá-Píla 2004, 96-99
- [30] S. Berezina, P. Zinin, M. Weihnacht, A. Sotnikov : *Brillouin scattering of DLC films*, Proceedings of APCOM 04, Applied Physics of Condensed Matter, 2004 pp. 32-37
- [31] P. Hockicko : *Application of e-learning in physic education*, Proceedings of 3rd international seminar E-learn04, Žilina 3. - 4. 2. 2004, p. 115 – 124 (in Slovak).
- [32] D. Pudiš, I. Martinček, I. Turek : *Near- and far-field scanning of semiconductor laser structures*, Proceedings of APCOM 04, Applied Physics of Condensed Matter, 2004 pp. 215-218
- [33] Dusan Pudiš, Daniel Kacik, Ivan Martincek, Ivan Turek : *Chemically tapered optic fibres: principle of operation, preparation and their transmission characteristics*, Proceedings of ELEKTRO04, ELEKTRO 04, 2004, pp. 364-367 (in Slovak)
- [34] P. Bury : *Acoustic deep level transient spectroscopy of multilayered semiconductors*, SNST 2004, Silicon-news in science and technology, Podbanské 2004, 13-22
- [35] D. Pudiš, I. Martinček : *The optical fiber tip preparation for NSOM measurements, Nekonvenčné technológie (Unconventional Technologies)*, NT 04, Žilina 2004, p. 22
- [36] M. Richterova, V. Lisy : *Deformability of multilamellar vesicles*, Book of Abstrakt, p. 701, Slovak Biophysical Symposium Herľany, september 2004
- [37] D. Bruncko, Gintner M., I. Melo : *PHENOMENOLOGY OF VECTOR RESONANCES AT FUTURE e+e- COLLIDERS*, Proceedings of 14th Conference of Slovak physicists, Smolenice 2004, (in press)

- [38] V. Žucha, Šutta P., Jackuliak Q., Novotný I., Tvarožek V. : *Voigt size-strain Broadening of the pd thin films deposited on Glass*, Proceeding of the 10 th International Workshop on Applied Physics of Condensed Matter, Častá-Píla 2004, 319-324
- [39] P. Peterka, P. Dymák, P. Honzátko, V. Matějec, J. Kaňka, T. Martan, B. Vraný, D. Kacik, Wayne Padden, Katja Lyytikainen : *MEASUREMENT OF CHROMATIC DISPERSION AND DOUBLE REFRACTION OF MICROSTRUCTURAL OPTIC FIBRES*, Optické komunikace 2004, pp.137-144 (in Czech)
- [40] Bracinikova, J. Bracinik, J. Kejst : *Conditions which limit the precision at contactless photoacoustic measurement of thermal conductivity of thin discs*, Proc. of Int. Conf. ELEKTRO 04, Žilina 2004, 360-361 (in Slovak)
- [41] J. Štelina, M. Ctibor : *Selected demonstrations in optics – wave properties of light*, Proceedings of the conference "Research and educational activities at physics dept. at techn. universities in Slovakia", Bratislava 2004, 57-58 (in Slovak)
- [42] J. Štelina, I. Bellan, C. Musil, P. Virdzek : *Some experiences and results obtained while teaching physics at the faculty of Civil Engineering, ŽU*, Proceedings of the conference "Research and educational activities at physics dept. at techn. universities in Slovakia", Bratislava 2004, 64-65 (in Slovak)
- [43] J. Štelina, J. Bracinik, C. Musil : *Investigation of kinetics of nanoparticles in colloid fluids*, Proceedings of the conference "Research and educational activities at physics dept. at techn. universities in Slovakia", Bratislava 2004, 59-63 (in Slovak)
- [44] P. Virdzek : *The use of in situ method for the determination of concentration of radionuclides in soil*, Proceedings of the conference "Research and educational activities at physics dept. at techn. universities in Slovakia", Bratislava 2004, 118-122 (in Slovak)
- [45] Hockicko, P.: *E-learning in the process of physics education*, Proceedings of 4th conference Infovek, Spišská Nová Ves 5. - 8. 11. 2003, ÚIPŠ - INFOVEK, Staré Grunty 52, Bratislava 2004, pp. 273-281, ISBN 80-7098-381-7 (in Slovak)
- [46] Jamnický, I., Bellan, I.: *Method of investigation of deep levels in semiconductors*, Proceedings of conference "Research and educational activities at physics dept. at techn. universities in Slovakia", Bratislava 2004, 123-124 (in Slovak)

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