

DEPARTMENT OF PHYSICS

<http://www.kf.elf.stuba.sk>

Head of Department

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I. STAFF

Professors	Prof. Ing. Peter Ballo, PhD., Prof. Ing. Július Cirák, PhD., Prof. Ing. Rudolf Durný, DrSc., Prof. RNDr. Július Krempaský, DrSc.
Associate Professors	Doc. Ing. Peter Bokes, PhD., Doc. RNDr. Ivan Červeň, PhD., Doc. Ing. Peter Dieška, PhD., Doc. RNDr. Edmund Dobročka, PhD., Doc. RNDr. Peter Markoš, DrSc., Doc. Ing. Ján Vajda, PhD., Doc. RNDr. Pavol Valko, PhD.
Assistant Professors	Ing. Ondrej Foltin, PhD., RNDr. Juraj Chlpík, Mgr. Michal Kopčok, Ing. Tatiana Šrámková, RNDr. Róbert Turanský, RNDr. Mária Valková, Mgr. Marek Vančo, PhD., Ing. Martin Weis, PhD., Ing. Ivan Zelenay, PhD.
Senior Scientist	Ing. Jozef Bielek, PhD.
Research Workers	Ing. Eubomír Keleši, Mgr. Martin Konôpka, PhD., Ing. Vlasta Macková, PhD., RNDr. Martin Moško, PhD., Ing. Jaroslav Tóbič, PhD., Ing. Pavol Tomčík, Ing. Alfred Vlnieška,
Technical Staff	Zuzana Váciová (secretary), Štefan Kučera
PhD. Students	Ing. Miroslava Diešková, Ing. Michal Sokolský, Ing. Tomáš Váry

II. EQUIPMENT

II.1 Teaching and Research Laboratories

- Laboratories of elementary and advanced physics
- Laboratory of ordered molecular layers and systems
- Laboratory of applied optics
- Laboratory of X-ray diffraction
- Laboratory of thermophysical properties
- Laboratory of macrostructure of composites
- Laboratory of material simulation
- Laboratory of spectroscopy
- Center for computational materials science

II.2 Special Measuring Instruments and Computers

- Refrigerator cooled cryostat NOK-10-3D
- Langmuir - Blodgett deposition device, Nima, U.K.
- Electrostatic voltmeter Trek
- 7801 Solartron special multimeter
- Measuring microscope CZJ
- Brewster angle microscope
- X-ray diffraction powder goniometer
- 4 numerical servers (clusters) with 60 nodes (140 cores) - supporting infrastructure (incl. Myrinet)
- Sun storage tek 6140 FC maxperf
- 2 x Sun Fire server.

III. TEACHING**III.1 Undergraduate Study (Bc.)**

Subject, semester, hours per week for lectures and for seminars or practical exercises, name of lecturer:

Introduction to Technical Physics	(1st sem., 0-2h)	J. Krempaský, A. Vlnieška
Physics	(2nd sem., 3-2h)	J. Cirák
Physics I	(2nd sem., 3-2h)	P. Ballo, P. Markoš, P. Valko, O. Foltin, I. Červeň
Special Seminar - Physics I	(2nd sem., 0-2h)	P. Ballo, P. Markoš, P. Valko, A. Vlnieška
Physics II	(2nd sem., 3-2h)	M. Vančo
Special Seminar - Physics II	(2nd sem., 0-2h)	M. Vančo
Physics	(3rd sem., 3-2h)	P. Valko
Special Seminar - Physics	(3rd sem., 0-2h)	P. Valko
Physics I	(3rd sem., 3-2h)	M. Vančo
Special Seminar - Physics I	(3rd sem., 0-2h)	M. Vančo
Physics II	(3rd sem., 3-2h)	J. Cirák, P. Markoš, T. Šrámková
Special Seminar - Physics II	(3rd sem., 0-2h)	P. Markoš, I. Zelenay
Modern Physics	(5th sem., 3-2h)	P. Markoš
Modern Methods of Material Diagnostics	(5th sem., 3-2h)	E. Dobročka
Modeling and Simulation	(5th sem., 2-3h)	P. Ballo
Thermodynamics of Materials and Statist. Physics	(6th sem., 3-2h)	M. Moško
Solid State Physics	(6th sem., 3-2h)	R. Durný

III.2 Graduate Study (Ing.)

Physics of Processes	(1st sem., 3-2h)	P. Bokes
Superconductivity and Low Temperature Physics	(1st sem., 2-2h)	P. Valko
Nanotechnologies	(1st sem., 2-2h)	J. Cirák
Bioelectronics	(1st sem., 2-1h)	J. Cirák
Principles of Applied Optics	(1st sem., 2-2h)	J. Vajda
Non-equilibrium Systems and Chaos	(1st sem., 3-2h)	P. Ballo
Applied Optics	(2nd sem., 3-2h)	J. Vajda
Biomaterials and Biosystems	(2nd sem., 2-2h)	J. Cirák
Physics of Materials I	(3rd sem., 3-2h)	P. Dieška, R. Durný

III.3 Undergraduate and Graduate Study for Foreign Students (in English Language)

Seminar - Physics I	(2nd sem., 2-0h)	R. Durný
Seminar - Physics II	(3rd sem., 2-0h)	R. Durný

IV. RESEARCH PROJECTS

- Hybrid spintronic nanostructures controlled by spin-polarized current. APVV-0173-06, J. Cirák
- Advanced opto- and micro-electronic devices based on organic materials. APVV-0290-06, J. Cirák
- Nanostructures for development of biosensors. APVV-0362-07, J. Cirák, R. Durný
- Investigation of new materials for hybrid (inorganic/organic) electronics. VEGA 2/7118/27. R. Durný
- Integrated education in nanotechnology and material science. KEGA 3/637108, P. Ballo
- The role of water in porous structures. VEGA 2/0146/08, P. Dieška, P. Ballo
- Thermo physical sensors. APVV-0497-07, P. Dieška
- Manipulation of nanoparticles by means of AFM techniques. VEGA 1/4008/07, P. Dieška, M. Konôpka
- Sound, image and biomedical signals digital processing. 102/VTP/2000, J. Bielek, P. Fuchs
- Gradient materials prepared by powder metallurgy of micro- and nano-particles. APVV-20-057805, J. Bielek
- Investigation of magnetic materials for electrical engineering, electronics, recording and electromagnetic compatibility applications. VEGA 1/3096/06, J. Bielek, J. Sláma
- Interactive multimedia project of teaching physics in technical universities. KEGA 3/108003, P. Ballo, J. Krempaský, I. Červeň
- Controlling spin polarization in nanostructures using electrical currents. VEGA 1/0452/09, P. Bokes
- Electronic and electromagnetic waves in small systems: Transport properties. VEGA 0633/09, P. Markoš
- Coherence, decoherence and disorder in metallic and superconducting systems. APVV-51-003505, P. Markoš

V. COOPERATION

V.1 Cooperation in Slovakia

- Faculty of Chemical and Food Technology, STU, Bratislava
- Faculty of Informatics and Information Technologies, STU, Bratislava
- Faculty of Mechanical Engineering, STU, Bratislava
- Faculty of Material Technology, STU, Trnava
- University of Trnava, Trnava
- Natural Science Faculty, Comenius University, Bratislava
- School of Medicine, Comenius University, Bratislava
- Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava
- Faculty of Pharmacy, Comenius University, Bratislava
- Electrotechnical Faculty, University of Žilina, Žilina
- Institute of Physics, Slovak Academy of Sciences, Bratislava
- Institute of Electrical Engineering, Slovak Academy of Sciences, Bratislava
- Institute of Polymers, Slovak Academy of Sciences, Bratislava
- Institute of Informatics, Slovak Academy of Sciences, Bratislava
- Institute of Materials and Machine Mechanics, Slovak Academy of Sciences, Bratislava

V.2 International Cooperation

- Tomáš Baťa University, Zlín, CzR
- Institute of Macromolecular Chemistry, AVČR, Prague, CzR
- Natural Science Faculty, Charles University, Prague, CzR
- University of West Bohemia, Plzeň, CzR
- Tokyo Institute of Technology, Tokyo, Japan
- Fukuoka University, Fukuoka, Japan
- University of York, U.K.
- Universitat Politècnica de Catalunya, Barcelona, Spain
- Centro de Física Nuclear, Lisbon, Portugal
- PTB Braunschweig, Germany
- Ruhr Universität, Bochum, Germany
- Technische Universität, Munich, Germany
- Physikalisches Institut, Universität Münster, Germany
- Delft University, Delft, The Netherlands
- Institute of Solid State Physics, Graz University of Technology, Graz, Austria
- Università di Modena e Reggio Emilia, Modena, Italy
- Ames Laboratory, Ames, Iowa, USA

V.3 Membership in International Organizations and Societies

- J. Cirák: American Physical Society
- P. Ballo, P. Bokes, J. Cirák, I. Červeň, R. Durný, J. Krempaský, P. Valko: Europhysical Society
- J. Cirák: IEEE
- J. Krempaský: The New York Academy of Sciences
- J. Krempaský: Academia Scientiarum et Artium Europaea
- P. Markoš: Optical Society of America

VI. THESES

VI.1 Masters Theses

Masters theses supervised at the Department of Physics. The names of supervisors are in brackets.

- [1] Horváth, F.: Spin Hall effect – spin polarization induced by spin orbit coupling. (P. Bokes)
- [2] Kičinová, L.: Spin Hall effect – internal magnetic field induced polarization. (J. Tóbiš)
- [3] Počarovský, Š.: Sources and character of noise in resistively and capacitively shunted Josephson junction. (P. Valko)

VII. OTHER ACTIVITIES

- Organizing the 15th international workshop - Applied Physics of Condensed Matter, APCOM '09. Liptovský Ján, 24 – 26 June 2009 (P. Ballo, J. Vajda, M. Vančo)
- Club of physicists (J. Cirák)
- Board of editors, Journal Electrical Engineering (P. Ballo)
- Board of editors, Horizons of mathematics, physics and computer sciences (I. Červeň)
- SPIE conference, Prague (P. Markoš)
- Beamline coordinator in European theoretical spectroscopy facility (P. Bokes)
- Member of Scientific Council of Institute of Electrical Engineering, Slovak Academy of Sciences, Bratislava (R. Durný)

VIII. PUBLICATIONS**VIII.1 Journals**

- [1] BOKES, P.: Wavepacket Basis for Time-Dependent Processes and Its Application to Relaxation in Resonant Electronic Transport. In: *Physical Chemistry Chemical Physics*. - ISSN 1463-9076. - Vol. 11, Iss. 17 (2009), p. 4579-4585. (in English)
- [2] ČERVENĚ, I.: Derivation of Thermodynamic Energy Balance Equation by Stefan Barta. In: *Obzory matematiky, fyziky a informatiky*. - ISSN 1335-4981. - Vol. 38, No. 3 (2009), p. 43-48. (in English)
- [3] ČÍK, G., DLHÁŇ, E., ŠERŠEŇ, F., PLECENÍK, T., ČERVENĚ, I.: Interactions of polarons in poly(3-dodecythiophene) at low temperature. In: *Synthetic Metals*. - ISSN 0379-6779. - Vol. 159, Iss. 7-8 (2009), p. 613-618. (in English)
- [4] DIEŠKA, P., ŠTICH, I.: Nanoengineering with Dynamic Atomic Force Microscopy: Lateral Interchange of Adatoms on a Ge(111)-c(2x8) Surface. In: *Physical Review B*. - ISSN 1098-0121. - Vol. 79 (2009), p. 125431.1-5. (in English)
- [5] FLESCHE, G.H., WERZER, O., WEIS, M., JAKABOVIČ, J., KOVÁČ, J., HAŠKO, D., JAKOPIĆ, G., WONDERGEM, H.J., RESEL, R.: A Combined X-ray, Ellipsometry and Atomic Force Microscopy Study on Thin Parylene-C Films. In: *Physica Status Solidi (a)-Applications and Materials Science*. - ISSN 1862-6300. - Vol. 206 (2009), p. 1727-1730. (in English)
- [6] GMUCOVÁ, K., WEIS, M., DELLA PIRRIERA, M., PUIGDOLLERS, J.: A Comparative Study of Hydrogen- and Hydroxyl-Related Pentacene Defect Formation in Thin Films Prepared by Langmuir-Blodgett Technique and Thermal Evaporation. In: *Physica Status Solidi (a)-Applications and Materials Science*. - ISSN 1862-6300. - Vol. 206 (2009), p. 1404-1409. (in English)
- [7] JAKABOVIČ, J., KOVÁČ, J., WEIS, M., HAŠKO, D., SRNÁNEK, R., VALENT, P., RESEL, R.: Preparation and Properties of Thin Parylene Layers as the Gate Dielectrics for Organic Field Effect Transistors. In: *Microelectronics Journal*. - ISSN 0026-2692. - Vol. 40 (2009), p. 595-597. (in English)
- [8] KONÔPKA, M., TURANSKÝ, R., DUBECKÝ, M., MARX, D., ŠTICH, I.: Molecular Mechanochemistry Understood at the Nanoscale: Thiolate Interfaces and Junctions with Copper Surfaces and Clusters. In: *Journal of Physical Chemistry C*. - ISSN 1932-7447. - Vol. 113 (2009), p. 8878-8887. (in English)
- [9] MALINARIČ, S., DIEŠKA, P.: Dynamic Measurements of the Temperature Coefficient of Resistance in the Transient Plane Sensor. In: *International Journal of Thermophysics*. - ISSN 0195-928X. - Vol. 30 (2009), p. 1557-1567. (in English)
- [10] MALINARIČ, S., DIEŠKA, P.: Improvements in the Dynamic Plane Source Method. In: *International Journal of Thermophysics*. - ISSN 0195-928X. - Vol. 30 (2009), p. 608-618. (in English)
- [11] NISHIDA, A., TAKA, Ch., CHROMIK, Š., DURNÝ, R.: Investigation of Critical Properties in MgB₂/SiC/Si Thin Films Prepared under Varied Conditions. In: *Journal of Physics: Conference Series*. - ISSN 1742-6588. - Vol. 150 (2009), Art. no 052186. (in English)

- [12] SIFFALOVIČ, P., MAJKOVÁ, E., CHITU, L., HALAHOVETS, Y., JERDEL, M., SENDERÁK, R., LUBY, Š., WEIS, M., ŠATKA, A., ... [et al.]: Fabrication and Characterization of Hybrid Tunnel Magnetoresistance Structures with Embedded Self-Assembled Nanoparticle Templates. In: *Acta Physica Polonica A*. - ISSN 0587-4246. - Vol. 115 (2009), p. 332-335. (in English)
- [13] VERSTRAETE, M.J., BOKES, P., GODBY, R.W.: First-Principles Conduction of Nanoscale Junctions from the Polarizability of Finite Systems. In: *Journal of Chemical Physics*. - ISSN 0021-9606. - Vol. 130 (2009), p. 124715.1-8. (in English)
- [14] WEIS, M., GMUCOVÁ, K., HAŠKO, D., MÜLLEROVÁ, J.: Structural and Electronic Properties of Pentacene/Pentacenequinone Thin Films Prepared by Langmuir-Blodgett Technique. In: *Collection of Czechoslovak Chemical Communications*. - ISSN 0010-0765. - Vol. 74, No. 4 (2009), p. 565-579. (in English)

VIII.2 Conference Proceedings

- [1] BALLO, P.: Microscopic Structure and Magnetic Properties of Σ 5 Grain Boundary in Iron. In: *CMAS 2009. Computational Modelling and Advanced Simulations: International Conference*. Bratislava, Slovak Republic, 30.6.- 3.7.2009. - Bratislava: STU, 2009. - ISBN 978-80-227-3067-9. - CD-Rom. (in English)
- [2] BOKES, P.: Stroboscopic Wavepacket Description of Non-Equilibrium Many-Electron Problems. In: *DPG Spring Meeting of the Condensed Matter Section: Dresden, Germany, 22.-27.3.2009*. - Bad Honnef: Deutsche Physikalische Gesellschaft, 2009. - p. 507. (in English)
- [3] CHLPIK, J., DRŽÍK, M., KOLEDA, M.: Time Resolved Photothermal Deflection Measurement of Semiconductor Materials Thermal Parameters. In: *Physics of Materials '09: Scientific Conference*. Košice, Slovak Republic, 14.-16.10.2009. - Košice: TU, 2009. - ISBN 978-80-8086-122-3. - p. 113-115. (in English)
- [4] CIRÁK, J.: Self-Organization in Two-Dimensional Organic Molecular Systems (Applications in Biomembranes). In: *Physics of Materials '09: Scientific Conference*. Košice, Slovak Republic, 14.-16.10.2009. - Košice: TU, 2009. - ISBN 978-80-8086-122-3. - p. 61-65. (in English)
- [5] DIEŠKOVÁ, M., BOKES, P.: Transport Properties of Ultrathin Interfaces Based on Al/AlO_x/Al. In: *17th Conference of Slovak Physicists*. Bratislava, 16.-19.9.2009. - Bratislava: Slovak Physical Society, 2009. - ISBN 978-80-969124-7-6. - p. 127-128. (in English)
- [6] EMMER, Š., KOVÁČIK, J., BIELEK, J.: Wear Resistance of Particulate Cu-Graphite Composite System. In: *EUROMAT 2009: European Congress on Advanced Materials and Processes*. Glasgow, United Kingdom 7.-10. 9. 2009. - Institute of Materials, Minerals and Mining, 2009. - C51-6. (in English)
- [7] HARMATHA, L., BALLO, P., ŤAPAJNA, M., CSABAY, O., NEMEC, M.: The Effect of High Temperature Annealing on the Properties of MOS Structures on Nitrogen Doped Silicon. In: *APCOM 2009. Applied Physics of Condensed Matter: 15th International Workshop*. Bystrá, Slovak Republic, 24.-26.6.2009. - Žilina: University of Žilina, 2009. - p. 156-159. (in English)
- [8] HORVÁTH, F., BOKES, P., KIČÍNOVÁ, L., TÓBIK, J.: Spin Hall Effect - Spin Polarisation Induced by Spin-Orbit Interaction and by Internal Magnetic Field. In: *17th conference of Slovak Physicists*. Bratislava, 16.-19.9.2009. - Bratislava: Slovak Physical Society, 2009. - ISBN 978-80-969124-7-6. - p. 107-108. (in English)
- [9] HORVÁTH, F., BOKES, P.: Spin Hall Effect - Spin Polarization Induced by Spin-Orbit Interaction. In: *ŠVOČ 2009. Proceedings of Winning Works*. Bratislava, Slovak Republic, 29.4.2009. - Bratislava: FEI STU, 2009. - ISBN 978-80-227-3094-5. - CD-Rom. (in Slovak)

- [10] KOVÁČIK, J., BIELEK, J., EMMER, Š.: Cu-Graphite Composites: Composition Dependence of Friction Coefficient. In: Friction, Wear and Wear Protection: International Symposium. Aachen, Germany, 9.-11.4. 2008. - Weinheim: Wiley-VCH, 2009. - ISBN 978-3-527-32366-1. - p. 67-73. (in English)
- [11] KREMPASKÝ, J.: Physics and Culture in Time of Globalization. In: Globalization as a Platform of Intersection of Natural and Human Sciences: Bratislava, 10.-11.10.2008. - Bratislava: Ústredie slov. kresťan. inteligencie, 2009. - ISBN 978-80-85-293-06-7. - p. 62-72. (in Slovak)
- [12] KREMPASKÝ, J., HÚŠŤAVA, Š., VALKO, P.: Radioactivity as Possible Indicator Fractal Structure of the Physical Vacuum. In: Creative Teacher of Physics II: National Festival of Physics 2009. Smolenice, Slovak Republic, 19.-22.4.2009. - Bratislava: SFS, 2009. - ISBN 978-80-969124-8-3. - p. 3-8. (in Slovak)
- [13] SOKOLSKÝ, M., PETERKEOVÁ, D., WEIS, M., CIRÁK, J.: Effect of Calcium Ions on Molecular Interactions in Biomembranes. In: APCOM 2009. Applied Physics of Condensed Matter: International Workshop. Bystrá, Slovak Republic, 24.-26.6.2009. - Žilina: University of Žilina, 2009. - p. 140-143. (in English)
- [14] SOKOLSKÝ, M., CIRÁK, J.: Introduction to Dye-Sensitized Solar Cells. In: Physics of Materials '09: Scientific Conference. Košice, Slovak Republic, 14.-16.10.2009. - Košice: TU, 2009. - ISBN 978-80-8086-122-3. - p. 135-138. (in English)
- [15] TÓBIK, J., MOŠKOVÁ, A., MOŠKO, M.: Persistent Currents in Perfect Crystalline Insulators: Realistic Tight-Binding Model. In: 17th conference of Slovak Physicists. Bratislava, 16.-19.9.2009. - Bratislava: Slovak Physical Society, 2009. - ISBN 978-80-969124-7-6. - p. 49-50. (in English)
- [16] VÁRY, T.: Surface Plasmon Polaritons Interface between Two Dielectric Media. In: ELITECH '09: 11th Conference of Doctoral Students. Bratislava, Slovak Republic, 25.5.2009. - Bratislava: FEI STU, 2009. - ISBN 978-80-227-3091-4. - CD-Rom. (in English)

VIII.3 Parts of books

- [1] DIEŠKOVÁ, M.: Transport Properties of Ultrathin Al/AlO_x/Al Interfaces. In: Science and Supercomputing in Europe: Report 2008. - Bologna: Cineca, 2009. - ISBN 978-88-86037-22-8. - p. 503-507. (in English)
- [2] JAKABOVIČ, J., KOVÁČ, J., SRNÁNEK, R., KOVÁČ, J., SOKOLSKÝ, M., CIRÁK, J., HAŠKO, D., RESEL, R., ZOJER, E.: Interface Modification of Pentacene OFET Gate Dielectrics. In: Interface Controlled Organic Thin Films. - Berlin: Springer Verlag, 2009. - ISBN 978-3-540-95929-8. - p. 185-188. (in English)
- [3] KONÔPKA, M., TURANSKÝ, R., DOLTSINIS, N.L., MARX, D., ŠTICH, I.: Organometallic Nanojunctions, Probed by Different Chemistries: Thermo-, Photo-, and Mechano-Chemistry. In: Advances in Solid State Physics, Vol. 48. - Berlin Heidelberg: Springer Verlag, 2009. - ISBN 978-3-540-85858-4. - p. 219-235. (in English)
- [4] VÁRY, T., MARKOŠ, P.: Propagation of Surface Plasmons through Planar Interface. In: Proceedings of SPIE. Vol. 7353: Metamaterials IV: Prague, Czech Republic, 20.-22.4.2009. - Washington: SPIE - The International Society for Optical Engineering, 2009. - ISBN 978-08-194762-72. - Art. No.73530K. (in English)