

**DEPARTMENT OF NUCLEAR PHYSICS AND TECHNOLOGY**

<http://www.elf.stuba.sk/departments/kjft/kjft.html>

**Head of Department**

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**I. STAFF**

Professors	Prof. Ing. Jozef Lipka, DrSc., Prof. Ing. Marcel Miglierini, DrSc., Prof. Ing. Vladimír Nečas, PhD., Prof. Ing. Jozef Sitek, DrSc., Prof. Ing. Vladimír Slugeň, PhD.
Associate Professors	Doc. Ing. Ján Haščík, PhD., Doc. Ing. Mária Pavlovič, PhD
Assistant Professors	Ing. Róbert Hinca, PhD., Ing. Andrea Šagátová, PhD.
Senior Scientists	RNDr. Štefan Krnáč, PhD., Ing. Milan Seberíni, PhD., Ing. Ignác Tóth
Research Workers	Ing. Jarmila Degmová, PhD., Ing. Gabriel Farkas, Ing. Marek Hudák, Ing. Jozef Keníž, Ing. Vladimír Kršjak, Bc. Svetozár Michálek, Ing. Martin Petriska, Ing. Miloslav Rajčan, Ing. Dušan Solivajs, Ing. Stanislav Stanček, Bc. Ivan Strašík, Ing. Klement Vitázek, PhD.,
Technical Staff	Eva Mániková (secretary), Peter Mikula, Andrea Podhájska
PhD. Students	Ing. Peter Bezák, Ing. Juraj Breza, Ing. Július Dekan, Ing. Tomáš Kaňuch, Ing. Vladimír Kršjak, Ing. Milan Ladzianský, Ing. Svetozár Michálek, Ing. Marek Mikloš, Ing. Matúš Mozolík, Ing. František Ondra, Ing. Milan Pavúk, Ing. Jozef Pritrsky, Ing. Peter Tatranský, Ing. Marek Vaško, Ing. Radoslav Zajac

**II. EQUIPMENT**

**II.1 Teaching and Research Laboratories**

**Nuclear Technologies Centre:**

- Laboratory of Mössbauer Spectroscopy
- Ion Beam Laboratory
- Laboratory of Positron Annihilation Spectroscopy
- Laboratory of Radiation Ecology
- Laboratory of Optical Spectroscopy
- Laboratory of Radioactive Isotopes
- Laboratory of Neutron Physics
- Computer Laboratory

**II.2 Special Measuring Instruments and Computers**

- Mössbauer Spectrometers - 3 units (77 - 1200 K)
- 1 MV Cascade Accelerator. Ion beam analyses: 2 MeV He<sup>2+</sup> RBS with UHV target chamber, sample heating 300 - 1200 K, 1 MeV H<sup>+</sup> PIXE; 1 channelling MeV H<sup>+</sup> NRA. Ion beam modification: 10 keV - 1 MeV ion implantation, high dose  $\sim 10^{19}$  ion/cm<sup>2</sup>
- Sector Magnet Mass Spectrometer, isotope resolution
- Life-Time and Angular Correlation Positron Annihilation Spectrometers
- Low-Background Chamber with HPGe detector and gamma ray spectrometer
- Department's LAN computer network

### II.3 Special Software

- Particle Beam Optics Laboratory PBO Lab™ 2.1
- Transport
- Trace-3D
- Electrostatic Palette
- WinAGILE
- SRIM
- MCNP-4C2
- VISED
- SCALE 4.4a
- GENIE 2000

## III. TEACHING

### III.1 Undergraduate Study (Bc.)

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

Accelerators and Their Applications	(5th sem., 2-2h)	M. Pavlovič
Nuclear Installations	(4th sem., 3-2h)	V. Nečas, V. Slugeň
Sources of Radiation	(6th sem., 2-3h)	M. Miglierini
Basics of Ecology	(6th sem., 2-2h)	J. Sitek
Accelerator Physics and Technology	(7th sem., 2-2h)	M. Pavlovič
Materials of Nuclear Power Plants	(7th sem., 2-2h)	V. Nečas
Nuclear Electronics	(8th sem., 2-3h)	M. Seberíni, J. Sitek
Safety and Reliability of Nuclear Power Plants	(8th sem., 2-2h)	V. Slugeň
Ecobiophysics	(8th sem., 3-2h)	J. Degmová

### III.2 Graduate Study (Ing.)

Nuclear Physics and Technology	(1 st sem., 2-2h)	A. Šagátová
Experiments on Research Reactors	(1st sem., 0-3h)	J. Haščík, G. Farkas
Atomic and Molecular Spectroscopy	(1st sem., 2-2h)	M. Miglierini
Theory of Nuclear Reactors	(1st sem., 3-2h)	J. Haščík
Decommissioning of Nuclear Power Plants	(1st sem., 2-2h)	V. Nečas
Control of Nuclear Power Plant	(1st sem., 2-3h)	V. Slugeň
Team Projects	(1st sem., 0-4h)	R. Hince, K. Vitázek
Experimental Reactor Techniques	(2nd sem., 2-2h)	J. Haščík
Dosimetry	(2nd sem., 2-2h)	R. Hince
Operation of Nuclear Power Plants	(2nd sem., 3-2h)	V. Slugeň
Radiology and Nuclear Medicine	(win.sem., 3-1h)	M. Miglierini
Nuclear Physical Methods	(win.sem., 2-2h)	J. Sitek
Accelerator Physics and Technology I	(2nd sem., 2-2h)	M. Pavlovič

Accelerator Physics and Technology II	(3rd sem., 2-2h)	M. Pavlovič
Safety and Reliability of Power Engineering Installations	(3rd sem., 2-2h)	V. Slugeň

#### **IV. RESEARCH PROJECTS**

- Radioactive Materials in Innovative Nuclear Fuel Cycles and after Terminating the Operation of Nuclear Installations. VEGA 1/3160/06, V. Nečas
- Investigation of Technology, Physical and Detection Performances of X and Gamma Ray InP Based Detectors, VEGA 2/4151/24. Joint project with the Slovak Academy of Sciences, V. Nečas
- Knowledge Based Modification of Nanocrystalline Alloys Surface Layers. VEGA 1/1014/04, M. Miglierini
- Magnetic Structural Processes in Nano- and Microcrystalline States Materials Prepared from Amorphous Precursors. VEGA 1/3189/06, J. Sitek
- Radiation Embrittlement Study of NPP Advanced Construction Materials. VEGA 1/3188/06, V. Slugeň
- Perspective Thin Films and Structures for Electronics. VEGA 2/5130/25. Joint project with the Slovak Academy of Sciences, S. Stanček
- A New Generation Digital Radiology Kit. APVV-99-P06305, V. Nečas
- Study of Structural and Magnetic Properties of Nanophase and Amorphous Systems Based on 3rd Transition Elements. APVT-20-008404, M. Miglierini
- Magnetic Microstructure of Nanocrystalline Alloys, Slovak-French Bilateral Project, FR/SK/FEI STU/ 04, M. Miglierini
- Accelerators for Ion Cancer Therapy. Scientific and educational collaboration with Forschungs- und Technologietransfer GmbH, FOTEC, Wiener Neustadt, Austria, INTERREG III A, M. Pavlovič
- Experimental and Theoretical Study of Energy Deposition and Residual Activation Induced by Uranium Ions to Model the Beam Loss Hazards in the GSI Future Facility. INTAS Ref. Nr 03-54-3588, M. Pavlovič
- Positron Annihilation Study of Radiation Embrittlement of the Materials Used in Fusion Technology. 6th Framework Project of European Atomic Energy Community No FU 06-CT-2003-00040, V. Slugeň
- Prediction of Irradiation Damage Effects on Reactor Components (PERFECT). 6th Framework Project of European Atomic Energy Community No FI60-CT-2003-508840, V. Slugeň
- Study Contract Proton Irradiation of Samples using Cascade Accelerator. International Research Project with European Commission Institute of Advanced Materials, JRC Petten, V. Slugeň
- Coordinated Action of VVER Safety. 6th Framework Project of European Atomic Energy Community No FI06-COV-2005-012727, V. Slugeň
- RPV Embrittlement VVER Knowledge Management Project Support. International Research Project with European Commission, Institute of Energy, JRC Petten, IE B 101153, V. Slugeň
- Microstructural Characterisation of Fe-Cr Alloys: Simulation, Positron Annihilation, Mössbauer Spectroscopy. 6th Framework Project European Atom Energy Community No FU-CT-2005-00136, V. Slugeň

#### **V. COOPERATION**

##### **V.1 Cooperation in Slovakia**

- Cyclotron Centre of Slovak Republic, Bratislava
- DECOM Slovakia, Ltd., Trnava

- DECONTA, Trnava
- Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava
- Geological Institute, Slovak Academy of Sciences, Bratislava
- Institute of Electrical Engineering, Slovak Academy of Sciences, Bratislava
- Institute of Experimental Physics, Slovak Academy of Sciences, Košice
- Institute of Physics, Slovak Academy of Sciences, Bratislava
- Institute of Informatics, Slovak Academy of Sciences, Bratislava
- Institute of Preventive and Clinical Medicine, Bratislava
- International Laser Centre, Bratislava
- JAVYS, Jaslovské Bohunice
- University of P. J. Šafarik, Institute of Physical Sciences, Košice
- VUJE, a.s., Trnava
- Nuclear Regulatory Authority of the Slovak Republic, Bratislava
- Relko, Ltd., Bratislava
- Slovak Electric, plc., Bratislava
- Slovak Electric, plc., Decommissioning of the Nuclear Installations, Radioactive Waste and Spent Fuel Management, Jaslovské Bohunice
- Slovak Electric, plc., Mochovce Nuclear Power Plant, Mochovce
- Slovak Electric, plc., Bohunice Nuclear Power Plant, Jaslovské Bohunice
- Slovak Office for Normalization, Metrology and Testing, Bratislava
- Slovak Institute of Metrology, Bratislava
- BIONT, Bratislava

## V.2 International Cooperation

- All-Russian Scientific Institute of Experimental Physics, Theoretical Physics Department, Sarov, Russia
- Atominstytut der Österreichischen Universitäten, Vienna, Austria
- Centro de Investigación y de Estudios Avanzados del IPN Unidad Saltillo, Mexico
- Department of Nuclear Reactors, Technical University in Prague, CzR
- EFDA Close Support Unit, Garching, Germany
- Energovýzkum, Brno, CzR
- Flerov Laboratory of Nuclear Reactions, Joint Institute of Nuclear Research, Dubna, Russia
- Forschungs- und Technologietransfer GmbH, FOTEC, Wiener Neustadt, Austria
- Framatome ANP BT62 Brennelement Laboratory, Erlangen, Germany
- Fraunhofer-Institut für Zerstörungsfreie Prüfverfahren, EADQ, Dresden, Germany
- GSI, Accelerator Department, Darmstadt, Germany
- II. Physikalisches Institut, Universität Göttingen, Germany
- IMS - Nanofabrication, GmbH, Vienna, Austria
- Leibniz Institut für Festkörper- und Werkstoffforschung, Dresden, Germany
- Institute for Nuclear Research of the Russian Academy of Sciences, Neutron Research Department, Moscow, Russia
- Institute for Theoretical and Experimental Physics, High Energy Density in Matter Produced by Heavy Ion Beam Department, Moscow, Russia
- Institute of Advanced Materials, European Commission, JRC Petten
- Institute of Nuclear Techniques, Budapest University of Technology and Economics, Hungary
- Institute of Thin Films and Interfaces, Research Centre Jülich, Germany
- International Atomic Energy Agency, Vienna, Austria
- Laboratory of Nuclear Problems, Joint Institute of Nuclear Research, Dubna, Russia
- Leibniz Institute für Festkörperphysik, University Vienna, Austria
- Nuclear Research Institute, Řež, CzR
- Universität der Bundeswehr, München, Germany
- University of Gent, Belgium
- University du Maine, Le Mans, France
- Palacky University, Olomouc, CzR

### V.3 Membership in Slovak Organizations and Societies

- Academy Council of Slovak Nuclear Society (J. Lipka, M. Miglierini, V. Nečas, S. Sitek, V. Slugeň)
- Board of Nuclear Safety SE-EBO (J. Haščík)
- Nuclear Safety Advisory Committee SE, a.s. (V. Slugeň)
- Board of Nuclear Safety SE-EMO (V. Slugeň)
- Board of Nuclear Safety SE-VYZ (V. Nečas)
- Council of Nuclear Regulatory Authority of the Slovak Republic (V. Nečas, V. Slugeň)
- Co-ordination Board for Cooperation with JINR Dubna (V. Nečas)
- Expert Board of Cyclotron Centre of Slovak Republic (M. Pavlovič)
- Scientific Council of Slovak Institute of Metrology (V. Nečas)
- Slovak Nuclear Forum (J. Lipka - vice president)
- Slovak Nuclear Society (V. Slugeň - chairman, J. Degmová, J. Haščík, R. Hinca, Š. Krnáč, J. Lipka, M. Miglierini, V. Nečas, M. Petriska, J. Sitek, P. Tatranský, M. Mikloš, V. Kršjak)
- Slovak Physical Society (M. Miglierini, V. Nečas, J. Sitek, V. Slugeň)
- Slovak Spectroscopic Society (M. Miglierini - president, J. Degmová, J. Haščík, Š. Krnáč, J. Lipka, M. Seberini, J. Sitek, V. Slugeň, I. Tóth, members)
- State Examination Committee for the Verification of Operating Staff of Nuclear Installations Specific Abilities (J. Haščík)

### V.4 Membership in International Organizations and Societies

- ENEN Association (M. Miglierini, J. Haščík, V. Slugeň)
- European Nuclear Society (V. Slugeň)
- European Physical Education Network (V. Slugeň)
- German Nuclear Society (V. Slugeň)
- International Board on the Applications of the Mössbauer Effect "IBAME" (M. Miglierini)
- International Journal of Nuclear Energy Science and Technology, Member of the Editorial Board (V. Nečas)
- International Journal of Nuclear Knowledge Management, Member of the Editorial Board (V. Slugeň)
- OECD/NEA Bank's Computer Program Service (J. Lipka -Liaison Officer)
- Science and Technology Advisory Committee of EU - Area Nuclear Fusion (V. Slugeň)
- The Research Board of Advisors of the American Biographical Institute (M. Pavlovič)
- The Advisory Council of the International Biographical Centre Cambridge (M. Pavlovič)

### V.5 Contracts

- J. Haščík: Periodical Training of Supervising Physicists of the NPP Bohunice, JAVYS and Mochovce on the Experimental Nuclear Reactors. Contract with NPP Bohunice, Mochovce and JAVYS
- J. Lipka, Š. Krnáč, I. Tóth: Measurement of selected components of Ionisation Fire-Announcers. Contract with Am EKO Bratislava
- J. Haščík, M. Miglierini, V. Slugeň, R. Hinca, V. Nečas: Post-gradual requalification training course: Safety aspects of nuclear facilities operation. Contract with Slovenské elektrárne, a. s.
- V. Nečas, J. Breza, R. Zajac: Assessment of the Back-End Part of Nuclear Fuel Cycle of Fast Reactor. Contract with VUJE, a. s., Trnava
- V. Slugeň, M. Mikloš, R. Hinca, V. Kršjak, M. Petriska: Analysis of VVER Nuclear Fuel Degradation Process and Its Influence on Manipulation with Spent Nuclear Fuel in Condition of GovCo, a.s. Contract with GovCo, a.s., Jaslovské Bohunice
- V. Slugeň, M. Mikloš, V. Kršjak, R. Hinca: Scientific and Technical Problems Connected to Operation of the High Temperature Reactors (HTR). Contract with VUJE, a. s., Trnava

## **VI. THESES**

### **VI.1 Masters Theses**

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

- [1] M. Bočkay: Homostructural vs. heterostructural GaAs detectors with p-n junction (B. Zaťko, A. Šagátová)
- [2] V. Csiba: Analysis by nuclear resonance reactions (P. Kováč)
- [3] M. Drgoňa: Liquid scintillation spectrometry (M. Vršková, J. Sítek)
- [4] M. Galba: Modelling of nuclear fuel behaviour within the core (B. Hatala, V. Slugeň)
- [5] Oleksandr Havryliuk: Optimization of sample preparation for lifetime measurements (V. Kršjak)
- [6] A. Kopčáková: Transmutation modification of fuel assembly for the VVER-1000 reactor (Dařílek, V. Nečas)
- [7] M. Krčmárik: Measurement of radioactive substances in nuclear power plant outlets (P. Mikušik, R. Hinca)
- [8] M. Ladziarský: GaAs detectors for neutron detection (F. Dubecký, A. Šagátová)
- [9] S. Michálek: Proliferation potential of various types of spent fuel assemblies in a VVER-440 reactor (P. Dařílek, V. Nečas)
- [10] D. Morovics: Influence of irradiation on NPP construction materials (R. Hinca)
- [11] R. Sedláček: Computer determination of selected parameters in the process of decommissioning of NPP V-1 primary circuit (M. Vaško, V. Nečas)
- [12] Z. Šlavková: Monitoring of condition of burn-up fuel elements at the SE-VYZ burnt fuel buffer store (V. Slugeň, B. Hučko)

## **VII. OTHER ACTIVITIES**

- Organization of the Postgraduate Study “Safety Aspects of Nuclear Equipment Operation” for participants from different organizations. Organised for Slovak Electric, Plc.
- Organization of students excursion to Austrian Research Center Seibersdorf
- Organization of SNUS Annual Meeting Scientific Conference, 26 April 2006, Levice, Slovakia
- E. Wigner Course for Reactor Physics, 3 – 23 September 2006, Bratislava, Vienna, Prague, Budapest
- Organization of Scientific Conference: NUSIM, 27 - 28 April 2006, Levice, Slovakia
- Organization of International Conference “Secure Energy Supply” 26 - 29 September 2006, Bratislava, Slovakia
- Students Practical Exercises at the TRIGA Mark II Reactor in Atom Institute of the Austrian Universities, Vienna, Austria
- Students Practical Exercises at the School Reactor of the Budapest University of Technology and Economics, Budapest, Hungary
- Students Practical Exercises at the Training Reactor of the Czech Technical University in Prague, Czech Republic
- Organization of International meeting COVERS, 10 – 12 October 2006. Trnava, Slovakia
- Organization of International conference “Mössbauer Spectrometry in Material Research” 11 – 15 June 2006, Kočovce, Slovakia
- Organization of Seminar “45th Anniversary of the Department of Nuclear Physics and Technology”, 20 – 21 September 2006, Kočovce, Slovakia

## **VIII. PUBLICATIONS**