

Institute of Experimental Physics Slovak Academy of Sciences

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Summary of main results and activities

January 1, 2012 - December 31, 2015

Institute Management 2012 - 2015

2011 - 4.2015

director: deputy: scientific secretary: head of scientific board: K. Flachbart since 5.2015 KopčanskýA. JuríkováP. SzabóZ. Gažová/P.Kopčanský/P.Farkašovský

Established: January 1969



http://uef.saske.sk

Three physical branches:

- Cosmic rays
- High energy physics
- Magnetism

- -space physics
- subnuclear physics
- physics of condensed matter

Mission

- biophysics
- theoretical physics
- application oriented research
- services for other institutions (Internet, production and distribution of cryogenic liquids)
- covers distances from sub-proton ones up to interstellar ones
 covers temperatures / energies from values close to 0 K (superfluid ³He) up to highest temperatures accelerators energies or cosmic rays.

Research structure of IEP SAS

(DSnP)

(DM)

(DSpP)

(DLTP)

(DMP)

(DBP)

(DTP)

(LMP)

- Department of Subnuclear Physics
- Department of Magnetism
- Department of Space Physics
- Department of Low Temperature Physics
- Department of Metal Physics
- Department of Biophysics
- Department of Theoretical Physics
- Laboratory of Experimental Chemical Physics (LECHP)
- Laboratory of Nanomaterials and Applied Magnetism (LNAM)
- Laboratory of Materials Physics





IEP SAS Košice

Main Institute building Watsonova st. 47



- Management
- Subnucl.phys.
- Theor. phys.
- Metal physics
- Magnetism
- Library

Department of Space physics Laboratory at Lomnický štít



Park Angelinum / Jesenná st

Bulharská st. 2-6







Low temperature physicsMagnetism (partially)

Outline

I. Statistics

II. Research activities

III. Societal, cultural, and/or economic impact

IV. Vision of IEP SAS

V. Conclusion



Money of IEP SAS



Institutional contribution per year









citations

Number of CC publications

CC publications



■ IEP ■ IEP and large collab.

Science, Nature, PRL, Adv. Materials, EPL C, Astrophys. J., Biomacromol.,...

Number of citations



List of top-cited authors 2012-2015:

KAREL KUDELA	400				
PETER KOPČANSKÝ	378	Collaborations:			
MILAN TIMKO	360				
MARTINA KONERACKÁ	342 253	DUŠAN BRUNCKO	6744		
,		JAROSLAV ANTOŠ	2386		
MARIAN ANTALIK		IVAN KRÁLIK, LADISLAV Šándor	1752		
PETER SAMUELY	252	ONNEON			
MARIAN SEDLÁK	246				
JOZEF KAČMARČÍK	236				
PAVOL SZABÓ	219				
ΝΑΤΆLΙΑ ΤΟΜΑŠΟVΙČΟVΆ	202				

Invited presentations at international conferences

2012-2015: 74 invited presentations in 27 countries

II. Research activities / results

Selected activities / results

of structure units / research groups

Department of Subnuclear Physics CERN Experiments at LHC

ALICE Experiment

Heavy ion physics: strange particle and $\varphi(1020)$ production in p-p, Pb-Pb and p-Pb collisions at LHC energies

- > Responsibility LHC Interface, luminosity monitoring, normalization cross section measurement,
- > **ATLAS Experiment** search of Higgs boson
- Responsibility Liquid Argon (Lar) Calorimetry
- Development of 4 channels 12bit Analog Digital Converter (radiation hardened, fast response, for High Luminosity LHC experiments)





Department of Subnuclear Physics The best result



 Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC,

J. Antoš, D. Bruncko, E.Kladiva, P Stríženec, *Phys. Lett. B* 716 (2012), 1-29 (more then 6000 citation currently)

- deeply involved in the Liquid Argon (LAr) calorimetry detector, software, performance
- precise photon/electron measurement, used in many analyses
- most prominent the Higgs boson discovery

Department of Subnuclear Physics Research strategy and future development

- Near future (5-10 years) is determined by the experimental programmes at CERN LHC Collider
 - > **ALICE** experiment :
 - major upgrade already started
 - responsibility: Detector Control System for the new inner tracker
 - > **ATLAS** experiment:
 - major upgrade planned at the later stage
 - development of the radiation hard ADC chip



Department of Space Physics:

Detached Laboratory at Lomnický štít (LS)

Long term measurement of cosmic rays (CR) by neutron monitor (NM)

- describe variations of CR intensity in wide frequency range
- obtain relations between CR decreases (FDs),
- dosimetric measurements, space weather

References

Parnahaj I., Kudela K., Astrophys. Space Sci., 359, 1, 35-35, 2015
 Kudela K., Langer R., Rad. Protect. Dosim., 164, 4, 471-476, 2015
 Kancírová M., Kudela K., Atmos. Res., 149, 166-173, 2014
 Kubančák J. et al. J. Instrumentation, 9, 7018-7018, 2014
 Zigman V., Kudela K., Grubor D. Adv. Space Res., 53, 5, 763-775, 2014



LS (2634 m above sea) - suitable location for CR observations. Measurements by NM, in real time http://neutronmonitor.ta3.sk, in network: http://nmdb.eu, and by SEVAN, in network:

http://crd.yerphi.am/Lomnicky_stit_SEVAN_Data



Department of Space Physics: JEM-EUSO

- Extreme Universe Space Observatory (EUSO) on the Japanese Experiment
 Module (JEM) on the International Space Station (>2020)
- 16 Countries, 93 Institutes
- IEP / Slovakia member since 2008

Astrophysics for Energies > 5 × 10¹⁹ eV

Main Science Objectives:

- identification of UHECR sources
- measurement of the energy spectra of individual sources
 measurement of the trans-GZK spectrum

Responsibility:

-UV background measurements and data analysis

Selected JEM-EUSO result from 2012 - 2015

15 papers in special issue about JEM-EUSO experiment in journal *Experimental Astronomy, Volume* 40, Issue 1, 2015 (IF 1,99)





Department of Space Physics: Rosetta

Department of Space Physics contributed to construction of ESS-processor unit of Rosetta spacecraft that provided communication between Orbiter and lander Philae. The unit performed flawlessly during whole mission.









Reference

McKenna-Lawlor, S.,...,Balaz, J., et al. Performance of the mission critical Electrical Support System (ESS) which handled communications and data transfer between the Rosetta Orbiter and its Lander Philae while en route to and at comet 67P/Churyumov-Gerasimenko. Acta Astronautica **125** (2016).

Department of Space Physics: Vision

- Within the space physics (at IEP), the strategy is divided into two main research directions.
- ► The first is the particles of low and medium energy research
- The second is participation in the JEM-EUSO experiment

Department of Magnetism

Subjects of study

- 1. Systems with magnetic nanoparticles Centre of NANOFLUIDS
 - NP and MF for biomedical application
 - Oil based MF
 - magnetoferritin
 - ferronematics
 - magnetosome



- 2. Electrical transport and tunnelling phenomena valence fluctuating semiconductors
- 3. Multiferoics-manganites-ferrites



Ferrofluids based on transformer oil – energy applications

Electric field induced structural changes in magnetically controllable fluids



RAJŇÁK, Michal et al - Direct observation of electric field induced pattern formation and particle aggregation in ferrofluids. In *Applied Physics Letters*, 2015, vol. 107, no. 7, art. no. 073108







Vision:

Magnetic fluids

- biomedical applications (magnetic drug targeting, hyperthermia, MRI) based of COST Radiomag and APVV projects

- energy applications (cooling and dielectric isolation in power transformer technology) based on COST Nanouptake and APVV projects)

- liquid crystals and magnetic fluids to prepare to prepare liquid magnetic sensors

Valence fluctuating semiconductors

- the class of valence fluctuating semiconductors
- understanding the nature of electronic transport in valence fluctuating semiconductors

Multiferoics

- to study of the substitution effect in order to construct magnetic phase diagrams in whole concentration range from manganite to ferrite side.















Centre of Ultra Low Temperature Physics member of the European Microkelvin Platform

3 interconnected subjects

- 1. superconductivity
- 2. supefluid helium-3 & LT bolometers
- 3. magnetism in strongly correlated systems

+ helium liquifier & cryogenic infrastructure (supplying others, too)
+ in house developed equipment (dilution fridge, ULT STM, ac calorimetry, high pressure cells)
+ open access (guests from many countries)





Physics of superfluid helum-3 @ microkelvin *T*-range

homogeneously precessing domain represent Bose-Einstein condensate of magnons.



Result : massless Goldstone modes acquire energy/mass due to symmetry breaking fields

P. Skyba et al. 2 x Phys. Rev. B 2012



CULTP 2016+ / vision

From standard subjects to nanoscience for Quantum Technology Flagship

- > topological insulators/superconductors, atomic monolayer materials, 1D, 0D objects
- skyrmions, geometrically frustrated magnetic systems,
- > superfluid helium-3 as a model system for Majorana particles @ T = 0
- > nanoresonators in quantum limit

Home made, cutting edge instrumentation in next years

- calorimetry: resistive ac-calorimetry, nano-calorimetry, high-field calorimetry
- **scanning probe microscopes:** spin polarized STM, SHPM studies on nanoscale
- **resonance:** magnetic and mechanical resonance up to THz





Department of Metal Physics

Research activities:

- > plastic deformation and failure of amorphous and nanocrystalline alloys
- > thermal stability of systems with magnetite nanoparticles

Vision:

- > Extension of study to the deformation behaviour of high entropy alloys
- > establishing of the **dynamic DSC methods** of thermal analysis of nanoparticles systems



Department of Metal Physics

Deformation and failure of nanocrystalline alloys

International Journal of Plasticity 60 (2014), pp. 40 - 57, IF=5,971



Variation of the deformation mechanisms in a nanocrystalline Pd–10 at.% Au alloy at room and cryogenic temperatures



Yu. Ivanisenko ^{a,*}, E.D. Tabachnikova ^b, I.A. Psaruk ^b, S.N. Smirnov ^b, A. Kilmametov ^a, A. Kobler ^a, C. Kübel ^{a,c}, L. Kurmanaeva ^{a,d}, K. Csach ^e, Y. Mishkuf ^e, T. Scherer ^{a,c}, Y.A. Semerenko ^b, H. Hahn ^a

Specific features of fracture surfaces in nc Pd10Au:



Result: Failure of nanocrystalline PdAu alloy at low temperatures is ductile

Laboratory of Nanomaterials and Applied Magnetism

Energy harvesting device (EHD) based on soft magnetic nanocrystalline ribbons that converts mechanical vibrations to electricity

Targeted goal - development of EHD prototype with sufficient conversion efficiency and power density for applications in wireless sensor systems

EHD prototype with moving nc-ribbons beam and fixed permanent magnets

Power density 6.56 mW/cm³



EHD prototype with moving permanent magnets and fixed multilayer nanocrystalline ribbons core Power density 45.3 mW/cm³



Project: MNT-ERA.NET II STREAM (2012-2014)

Chiriac, H., Ţibu, M.,, Lupu, N., Škorvánek I., Ovári, T.-A., Nanocrystalline ribbons for energy harvesting applications, Journal of Applied Physics. 115, (2014) p. 17A320 (1-3)

I. Škorvánek, J.Marcin, J. Kováč, P. Švec, N. Lupu, H. Chiriac, Tuning of soft magnetic properties in FeCo- and FeNi-based amorphous and nanocrystalline alloys by thermal processing in external magnetic field, Mat. Sci. Forum, 783 (2014) 1937, (invited talk at THERMEC 2013, Las Vegas, USA)

Research strategy of LNAM

Development of novel materials for highly sensitive magnetic sensors (flux-gate, GMI)

- focus will be given on amorphous and nanocrystalline ribbons and microwires with high permealility
- tuning of their magnetic response (processing in external magnetic field)
- testing of sensors with ultra-high sensitivity in magnetically shielded room





Experimental facilities for thermal processing of materials in high magnetic fields (up to 14 T)



New magnetically shielded room at IEP SAS

Laboratory of Materials Physics

Preparation of magnet with highest value of trapped magnetic field YBCO bulk single-grain superconductor (BSS) - with chemical pining



Future perspectives

Basic research formation of effective nanosize pining centres in REBCO superconductors to obtain permanet magnets with desired magnetic map

Applications :

- cell separation
- magnetic drug targeting



Roadmapping Workshop: Bulk Superconductivity, Jun 7. 2016, University of Cambridge

Laboratory of Experimental Chemical Physics

I. A new original (bottom-up) approach to the preparation of polymeric nanoparticles

Controled self-assembly via thermoresponsive homopolymers with programable size of resulting nanoparticles.

Stability of particles (irreversibility of the self-assembly) reached by hydrogen bonding. **Two patents - Slovak Republic**

Key paper:

• M. Sedlák: A Novel Approach to Controlled Self-Assembly of pH-Responsive Thermosensitive Homopolymer Polyelectrolytes into Stable Nanoparticles, Advances in Colloid and Interface Science 2015, http://dx.doi.org/10.1016/j.cis.2015.12.005, (5-year IF = 10.42)





Laboratory of Experimental Chemical Physics

Vision (research strategy and further development):

Basic research on spontaneously occurring and induced target-oriented selfassembly of polymeric and nonpolymeric materials in liquid state with a rapid transfer of ideas from basic research to applied research, the traditional time scheme being to patent first, and then to publish.

□ Implementation of our patents in real life:

- Monitoring of contaminants in liquids used mainly in food and pharmaceitical industry

- Purification of industrially important liquids

Creative development of experimental methods, especially laser light scattering methods, and methodical work in this field.

Department of Theoretical Physics: The best results

The basic scientific investigation covers mainly three areas:

1) Condensed matter physics; 2) Non-linear stochastic dynamics; 3) Physics of elementary particles.

Condensed matter physics

Numerical proof of the Bose-Einstein condensation of preformed excitons in the system of strongly interacting f and d electrons [P. FARKASOVSKY, Europhysics Letters, 110 (2015) 47007].

Investigation of the electronic properties of the graphene curved structures (wormhole, perturbed nanocylinder and nanocones) R. PINCAK, J. SMOTLACHA, European Physical Journal B86 (2013) 480].

Non-linear stochastic dynamics

Influence of hydrodynamic fluctuations on the scaling regimes of the models of stochastic dynamics using quantum field theory methods [M. HNATICH, J. HONKONEN, T. LUCIVJANSKY, European Physical Journal B86 (2013) 214].

Influence of compressibility on anomalous scaling of correlation functions of a passive weak magnetic field in the Kazantsev-Kraichnan model [E. JURCISINOVA, M. JURCISIN, Physical Review E88 (2013) 011004(R)].

Phenomenology of elementary particles.

Study of various effects in nuclear targets. Importance of attenuation of the produced colorless dipole in the dense medium [B.Z. KOPELIOVICH, J. NEMCHIK, I. K. POTASHNIKOVA, I. SCHMIDT, Physical Review C86 (2012) 054904].

Department of Theoretical Physics : Future plans and objectives

CONDENSED MATTER PHYSICS

Strongly correlated electron systems: coexistence of charge and spin ordering, ferroelectric and ferromagnetic state, and finally, charge/spin ordering and superconductivity Graphene: expectation - superconductor.

Superfluid phases of He3 and its excitations: as a model system for the quantum field theory

NON-LINEAR STOCHASTIC DYNAMICS

Turbulence: the influence of the breaking of various turbulent environment symmetries on the behavior of correlation functions of passively advected fields.

PHENOMENOLOGY OF ELEMENTARY PARTICLES

Theoretical investigation of the onset of various effects occuring in interactions with nuclear targets.

Department of Biophysics

interdisciplinary research broad international collaboration

Protein stability - characterization of the structure and stability of various biomacromolecules (proteins, polynucleic acids, polysaccharides) in the presence of denaturants, salts and polyanions.

Protein amyloid structures - study of the mechanism of amyloid aggregation of proteins and treatment of the amyloidrelated diseases

Mitochondrial Oxidative Stress - to elucidate mechanisms by which ROS damage individual components of electron-transfer complexes.

Electron Transport in Photosynthetic Reaction Centers

- developing of the general master equations which describe the electron transfer in photosynthetic reaction centers

Biomedical image analysis - utilization of the specific NUI devices to control the "state of the art" of experimental devices (optical tweezers and scalpel)











European Research Area

Amyloid self-assemblies of poly/peptides

REASONS FOR STUDY

patology of more than 30 amyloid related diseases – Alzheimer, Parkinson's

- important for understanding of the nature and treatment of these disease

An open space

for knowledge an

RESULTS

- cytotoxicity morphology
- small molecules, short peptides, nanoparticles, fullerenol able to significantly inhibit amyloid aggregation
- > Inhibitors potential to be used for treatment of amyloid related diseases



Van Vuong Q., Siposová K. Truc Nguyen T., Antosova A., Balogova L., Drajna L., Imrich J. - Suan L., Mai, Gazova, Z. Binding of Glyco-Acridine Derivatives to Lysozyme Leads to Inhibition of Amyloid Fibrillization, Biomacromol., 2013, 14, 1035 (IF 5.371).



Mocanu M.M., Ganea C., **Siposova K**., Filippi A., **Demjen E., Marek J., Bednarikova Z., Antosova A.,** Baran I., **Gazova Z**., *Polymorphism of hen egg white lysozyme amyloid fibrils influences the cytotoxicity in LLC-PK1 epithelial kidney cells*, Int. J. Biol. Macromol., 2014, 65, 176 (IF 3.096)

Biomacromolecules

Vision:

- New era- amyloidomic

- to find the hypothesis for general mechanism of amyloid formation.
- identification of a new amyloid inhibitors solving problems connected to amyloid-related diseases
- formation of the "smart" hybrid nanostructures on the base of amyloid aggregates
- elucidation of the mechanisms by which the oxidative stress damages individual components of the electron-transfer complexes and verification of the participation of these complexes in antioxidant defence.
- visualization of novel supramolecular complexes and creation of novel materials structured in the micro- or nanometer scale using optical tweezers and two-photon polymerization reaction. Particles image analysis will be transformed into more advanced forms leading to micro/nanorobotics.

III. Societal, cultural, and/or economic impact

International position

- activitities:

- 7FP projects
- COST projects
- SVK- Taiwan
- others (JEM-EUSO, GAMAS)
- CERN, CDF, JINR

3

National position:

APVV (Slovak and Development Agency) projects: 36

- General calls- projects 17
- LPP (human potentials): 3
- Bilateral (collaboration): 16

Projects of SAS Centres of Excellence: 2

- Centre excelence of SAS- Nanofluids, P. Kopčanský, 2009-2013
- Centre of Low Temperature Physics and Material Research at Extreme Conditions, P. Samuely, 2011-2015

VEGA (Scientific Grant Agency) projects: 47

The scientists of IEP SAS are:

- referees of the most scientific journals- Science, Phys. Rev. Letters, Phys. Review B, Phys. Review E, Biomacromolecules, etc.
- > referees, repaorteurs and panelists of FP7 and H2020 projects, foreign grant agencies, etc.
- > members of the Selection Committees for beamtime experiments in ILL Grenoble and JINR Dubna

International conferences (co-) organized: 28 (~ 7/ year)

- Microkelvin 2012, 19.-24.3.2012, 90 participants, Smolenice, Slovakia
- Physics in Collision 2012, 12.-15.9.2012, 110 participants, Strbské Pleso, Slovakia
- CSMAG 13, Czech and Slovak Conference on Magnetism, 17.-24.6.2013, 320 participants, Kosice, Slovakia
 Structure and Stability of Biomacromolecules, 30.6.-3.7.2015, 60 participants, Kosice, Slovakia
 Mathematical modeling and computational physics 2015, 13.-17.7.2015, 80 participants, Stara Lesna, Slovakia

PhD. study

List of accredited programmes of doctoral studies, period of validity

- 2.4.1 General physics and mathematical physics with Faculty of Sciences, Pavol Jozef Safarik University, Košice (FS UPJŠ) - since 2004
- 4.1.3 Physics of condensed matter and acoustics with FS UPJS since 2004
- 4.1.5 Nuclear and subnuclear physics with FS UPJS since 2004
- **5.2.26 Materials with Faculty of Metallurgy**, Technical University, Košice since 2009



Postdoctoral positions supported by national and international resources:

Projects: provide new PhD and Post-doc positions

- Edufyce 2011-2012
- PhysNet 2013-2015
- Nanokop 2012-2013
- Positions for young Slovak researchers supported from EU Structural Funds and APVV projects: 7
- New post-doc positions supported by Slovak Academic Informational Agency (SAIA) and Videgrad Fund: 3
- The Slovak Academy of Sciences Supporting Fund of Stefan Schwarz- 15



PR®MATECH

New infrastructure – UHV LT STM



- Base pressure 10⁻¹⁰ mbar
- Joule-Thomson STM with base temperature 1K & magnetic field 3T
- ➢ 6 e-beam evaporators
- Ar⁺ sputtering & annealing of samples
- Quartz crystal microbalance
- Mass spectrometer, RHEED, XPS

SP STM (other authors): magnetic molecules



STM under control our study:



Atoms of graph

In-house developed equipment : We will introduce Spin Polarized STM to study magnetic atoms, skyrmions...

SC vortices in NbSe₂

Atoms of graphite

Applied research

Registered abroad

Registered patents:

- Kopčanský Peter, Timko Milan, Závišová Vlasta, Tomašovičová Natália, I.P. Studenjak, O.V.Kovalcuk. UA 99100 U Method for increasing of ion conductivity of the liquid crystal based composite. Owner/co-owner: Uzhhorod NationalUniversity, Užhorod, Ukraine
- Kopčanský Peter, Timko Milan, Gažová Zuzana, Šipošová Katarína, Šipošová Katarína, I.P. Studenjak, O.V.Kovalcuk . UA 99099 U Method for the optimal lysozyme concentration determination to form a lyotropic magnetic liquid crystal Owner/co-owner: Uzhhorod National Univerzity, Užhorod, Ukraine

Patent applications:

Sedlák Marián, Rak Dmytro. PCT/SK2015/050002

A Method for Determination of Content of Hydrophobic Compounds in Water-Miscible Organic Liquids Owner/co-owner: IEP SAS, Košice

Country: World

Applied research

Registered in Slovakia

Registered patents:

Sedlák Marián, Koňák Čestmír. 287951

Preparation method of polymeric nanoparticles on the basis of poly(ethylacrylic acid) homopolymers. Owner/co-owner: IEP SAS, Košice

Sedlák Marián, Koňák Čestmír. 288071

Polymeric nanoparticles on the basis of poly(propylacrylic acid) homopolymers and their preparation method. Owner/co-owner: IEP SAS, Košice

Kováč František, Petryshynets Ivan, Stoyka Vladimír, Škorvánek Ivan, Tibor Kvačkaj. 288322
Method of producing the non-oriented electrical FeSi steels having low watt losses. Owner/ co-owner: IMR SAS, Košice

Applied research

Registered in Slovakia

Patent applications:

Sedlák Marián, Rak Dmytro. PP50002-2014

Measurement of the alkane content in alcohols by the method of nanoseggregation in aqueous solutions. Owner/co-owner: IEP SAS, Košice

Sedlák Marián, Rak Dmytro. PP50001-2015

A Method for Determination of Content of Hydrophobic Compounds in Water-Miscible Organic Liquids. Owner/co-owner: IEP SAS, Košice

Diko Pavel, Volochová Daniela, Antal Vitaliy, Piovarči Samuel. PP 00089-2015
YBCO superconductor doped with samarium and its fabrication. Owner: IEP SAS
Diko Pavel, Piovarči Samuel, Antal Vitaliy. PP 00067-2014
YBCO superconductor treated by high pressure oxygenation. Owner: IEP SAS
Diko Pavel, Volochová Daniela. PP 00105-2013
Binary doped YBCO superconductor. Owner: IEP SAS

Popularisation of Science

Vedecký brloh (Science nest), Slovakia at CERN, Rosetta

Films– two 20 min popularization films: Mrazivý magnet (Freezing magnet) and Vidieť neviditeľné (See the invisible) for the serial Spectrum vedy (Spectrum of science).



Outreach activities	2012	2013	2014	2015	total
Articles in press media/internet popularising results of science, in particular those achieved by the Organization	15	10	7	7	39
Appearances in telecommunication media popularising results of science, in particular those achieved by the Organization	15	10	17	13	55
Public popularisation lectures	25	40	31	22	118





Steel Park – the entertainment and technical center of Košice was officially opened in 2013 as one of the main activities of the Košice – European Capital of Culture 2013 project. It is a result of cooperation between the city, the steelmaking company U. S. Steel Košice and three academic institutions – the Technical University of Košice, Pavol Jozef Šafárik University and Slovak Academy of Sciences.

Researchers night – is the biggest scientific popularization action in EU and Slovakia since 2006. The festival in Košice is organized in a Shopping Centre Optima, where the average number of visitors is above 15 000.

Research strategy and future development of the Institute for the next five years (2016-2020)

"current state of knowledge from international and national perspective"

FUTURE VISION

 to enhance the Institute's scientific impact
 to become one of the leading Central European centers for physics research

THE WAYS TO ACHIEVE THE GOALS:

- support of the research activities under the European flagship projects;
- support of international collaborations;
- support of inter- and multidisciplinary research teams/projects;
- expand the expertise of the research personnel;
- support the education of diverse student body with goals to raise excellent scientists;
- support research activities with a potential of rapid transfer of knowledge from basic research into innovative products and technologies;

Research strategy and future development of the institute for the next five years (2016-2020)

"current state of knowledge from international and national perspective"

OTHER WAYS TO ACHIEVE THE GOALS:

- open the majority of the Institute's scientific infrastructure to all academic and research entities in Slovakia;
- restructure the departments in order to motivate formation of new dynamic research teams/units;
- improve the administrative support for research programs by developing a clear and effective computerized system for administrative procedures;
- support of scientific popularization at the regional and national level by raising awareness of the importance of knowledge and scientific research for the development of the entire society.

Why we are here?

basic research

- Slovakia(Czechoslovakia) is a member state of CERN,
- member of JINR DUBNA(theoretical physics quantum field theory of turbulence, neutron study of matter)
- Iaboratory at Lomnicky peak, world network of cosmic ray study in connection to space wheater too EMSO projects , Rosseta
- ultra low temperature laboratory
- > Magnetism
- complex study of superconductivity
- > biophysics study of protein aggregation in frame of neurovegetative diseases research

new movement to applications

- magnetic fluids(MDT, energy industry)
- > nanocrystaline materials
- superconductive materials
- > polymer science

outreach activities

This was a period of structural funds Big effort for public procurements – 11 million Euros

FSAL

Many thanks to all people of the Institute