RESEARCH STRATEGY AND FUTURE DEVELOPMENT

INSTITUTE OF EXPERIMENTAL PHYSICS

Slovak Academy of Sciences

Košice

Research strategy and future development of the Institute

Increase human potential
Support international collaborations
Teach and train students

+

Build and use unique infrastructure

+

Identify topics with potential prospects

Excellent science

Successful international projects and patents

Enhanced reputation and attractiveness

Research strategy and future development of the Institute

QUANTUM TECHNOLOGIES

BIOTECHNOLOGIES

OTHER INNOVATIONS

ENERGY & ENVIROMENT

SPACE MISSIONS & PARTICLE PHYSICS

Research strategy and future development of the Institute

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QUANTUM TECHNOLOGIES

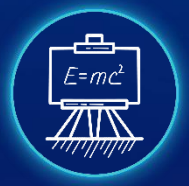
-founding partner of the Slovak National Research Platform on Quantum Technologies

-**skQCI project within EU call: DIGITAL-2021-QCI-01**
- creating national infrastructure for quantum communication
(quantum communication node: design of a prototype, including single photon detector)

-search for **Q-bits** in superconductors and superfluids

-**Impulz project TopoQ2D** (project of SAS for excellent researchers)
to study topological superconductivity in quantum systems

-Quantum nanotechnologies - new education curriculum envisaged



-quantum and thermal **entanglement** in bipartite/multipartite quantum systems

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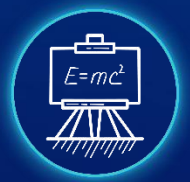
BIOTECHNOLOGIES

-**new therapeutical approaches** for amyloid-related diseases
(based on biocompatible small molecules, nanoparticles)

-magnetic nanoparticles for **diagnostics and therapy in oncology**
-amyloid based nanocomposites for drug delivery, industrial catalysis,…

-new magnetically active **nanotextile materials**



-photosynthetic **organisms for photovoltaics** and batteries

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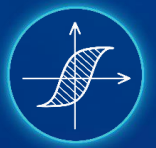
OTHER INNOVATIONS

-nanobubbles to **visualize tissues**, including pathological tissues

-liquid crystals based composites for **information storage and sensors**



-bilayers ribbons for **magnetic sensors or actuators**

-biomedical **lab-on-chip** applications for micro-rheology (flexible deformable micro-structures for biomedical applications) and single-cell manipulation

-thermometry for ultra low temperatures and high magnetic fields

-cooperation with **industry** - CAN superconductors (optimization of bulk HTC superconductors) and RV magnetics (micro-wires for applications in sensors)

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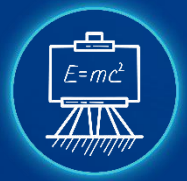
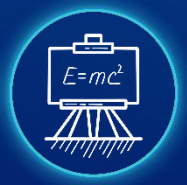
ENERGY & ENVIROMENT

-**contaminants removal** (including food and drug safety)

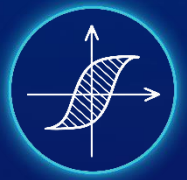


-role of bacteria for **water purification**
-charge transfer pathway and ionization behavior of fullerenes for **batteries**

-ferrofluids for **energy saving** and **energy harvesting**
-multiferroic and functional materials for **hydrogen storage**



-**magnetic refrigeration**, theoretical model for new materials



-soft magnetic materials with **reduced power losses**

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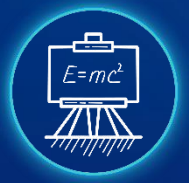
SPACE MISSIONS & PARTICLE PHYSICS

-apply **machine learning** methods for research of space weather
-build **open-source models** with web service for all cosmic rays models
-**space experiments** (ESA JUICE and JEM-EUSO)

-**ALICE** and **ATLAS** experiments - major upgrade
-hardware and software development, adaptation of computing facilities, physics analysis
-plans to build **successor of ALICE** detector



-phenomena occurring in diffractive electroproduction of **quarkonia**,
e.g. onset gluon shadowing and color transparency in kinematic regions
accessible by recent experiments at the LHC

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Visions for work in all departments are closely connected to current hot topics in technological, environmental and public health domains and match the priorities of European Union.

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The European research area can only be achieved when we work as a team.

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Thank you for your attention!