

SOME IMPORTANT SCIENTIFIC ACHIEVEMENTS

Cosmic ray research - "Experiment Pamir"

In 1971, on the initiative of the Physical Institute of the USSR Academy of Sciences (P.N. Lebedev FIAN) in the Pamirs in the Ak-Arkhar tract at an altitude of 4360 m above sea level, joint research began with scientists of our Institute to study the interaction of elementary particles and nucleons with nucleons and nuclei at energies above 10^{12} eV (experiment "Pamir"). In the course of the experiment, the installation of an X-ray emulsion chamber with an area of 1000 m^2 was assembled.

A number of unique and rare phenomena were observed in the Pamir experiment, such as the Sitara superfamily formed by a particle with an energy of about 10^{17} eV. The energy of interaction of particles of primary cosmic radiation of the superfamily "Tajikistan" was 10^{18} eV, which is the highest interaction energy of particles from all recorded in world practice using large X-ray emulsion chambers.

In the field of low temperature physics - cryosurgical instruments

S.U.Umarov Physical–Technical Institute of the National Academy of Sciences of Tajikistan, together with the Research Gastroenterological Institute of the Ministry of Health, invented an apparatus with which you can use liquid nitrogen to destroy invisible cancer cells on the spot. Only during 2016, already 50 patients with tuberculosis and cirrhosis of the liver, other diseases underwent operations using a new technology, and people went on the mend. To date, more than 300 successful cryosurgical operations have been performed. Prior to this, this technology was used in the Moscow Cancer Center, and it was also used in Holland, Italy and Japan. Prior to the implementation of this invention, this method of treatment was not available for Tajikistan.

In the field of atmospheric physics - "PollyNet" technology

At the S.U.Umarov Physical–Technical Institute, the direction "Physics of the atmosphere" includes the study of the state of the atmosphere, parameters affecting the state of the climate and the ozone layer, as well as the study of the processes of formation of atmospheric aerosol as a result of dust storms and monitoring of the state of technogenic pollution of the atmosphere: measurements of the total ozone content in vertical column of the atmosphere in different periods of the year.

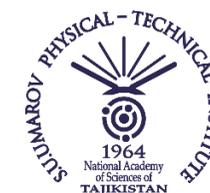
The Institute has been cooperating for several years with the Leibniz Institute for Tropospheric Research (TROPOS) of Germany. June 26, 2019 at the S.U.Umarov Physical–Technical Institute the sixth measuring station of the global network of the atmosphere for climate research "PollyNet" has started to operate. The new station is the first in Central Asia and lies within the global dust belt stretching from Morocco to China.

Publications and inventions

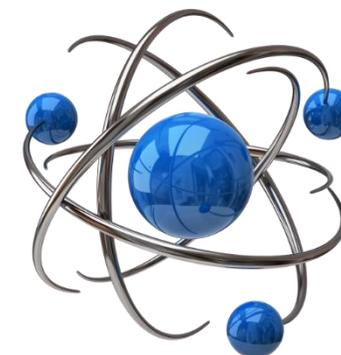
During the period of 30 years of State independence of the Republic of Tajikistan, the staff of the Institute published more than 3800 scientific materials, including more than 120 monographs and 1200 scientific articles in foreign journals.

During this period, more than 180 documents on the protection of intellectual property were received, including 160 patents and 20 certificates of registration of information resources at the National Patent Information Center of the Republic of Tajikistan and at the Federal Service for Intellectual Property "Rospatent" of the Russian Federation.

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GENERAL INFORMATION

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INTERNATIONAL STATUS:

Basic organization of the state parties of the Commonwealth of Independent States for scientific personnel training in the field of the physical and technical sciences
(from 10.12.2020)

SCIENTIFIC UNITS

- ☉ International Center for Nuclear Physics Research (2005)
- ☉ Center for Research and Use of Renewable Energy Sources (2008)
- ☉ Atmospheric Physics Laboratory (1986)
- ☉ Quantum Electronics Laboratory (1969)
- ☉ Molecular Spectroscopy Laboratory (2006)
- ☉ Department of Nanomaterials and Nanotechnology (2008), structurally covering 4 divisions:
 - Sector for Theoretical Physics (1967)
 - Crystal Physics Laboratory (2005)
 - Physical Acoustics Laboratory (1981)
 - Laboratory for Low Temperature Physics and Superconductivity (2019)
- ☉ Department of Science and Industry Relations (2020)
- ☉ Department of Informatization (2019)
- ☉ Computing cluster (2019)

DIRECTION OF SCIENTIFIC RESEARCH

- ☉ Nuclear physics
- ☉ Theoretical physics
- ☉ Condensed matter physics
- ☉ Optics, quantum electronics
- ☉ Physical and technical problems of energy
- ☉ Physics of the atmosphere
- ☉ Application of physical research methods in medicine,
which solve the following problems:
 - Nuclear physics research methods
 - Cosmic rays and ultra-high energy physics
 - Semiconductor physics
 - Crystal formation and structure
 - Physics of ferroelectrics and dielectrics
 - Condensed Matter Physics at Low Temperatures
 - Spectroscopy
 - Coherent nonlinear optics
 - Acoustics
 - Study of physical processes in the atmosphere
 - Renewable energy sources
 - Quantum modeling of the molecular structure of innovative materials
 - Numerical and computer modeling of nonlinear phenomena of physical systems.