



Experience of Tomsk Polytechnic University in engineering field

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Since 2015 we are in process of establishment of international High Energy Physics Laboratory Megascience.

Based on our technological and engineering experience we identified the following priority directions:

- RD51
- LHCb
- CMS
- CERN IT/ATLAS
- DESY (beam instrumentation and linear collider detector instrumentation)



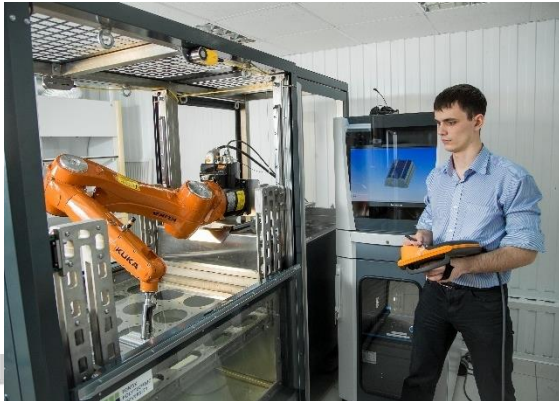
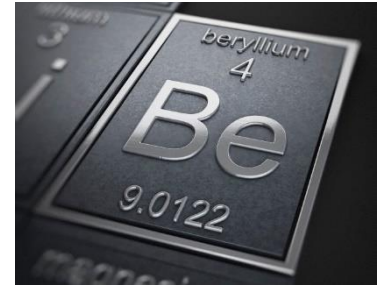
Institutes



- Institute of Natural Resources
 - Institute of Power Engineering
 - Institute of High Technology Physics
 - **Institute of Cybernetics**
 - Institute of Non-Destructive Testing
 - **Institute of Physics and Technology**
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- Institute of Humanities, Social Sciences & Technologies
 - Institute of International Education and Language Communication
 - E-Learning Institute
 - Institute of Strategic Partnership and Competencies Development
 - Yurga Technological Institute



- Metal beryllium production technology
- Unique technologies of water treatment, decontamination and sewage purification
- Thorium-based fuel for the next generation high-temperature reactors



- Solid oxide fuel cells for natural gas generators
- Solid fuel gasification units
- Radiation complexes for industrial tomography and oversized cargo inspection
- First domestic microtomograph for laboratory animals

RESEARCH RESULTS



- Unique meteorite optically-transparent coatings for spacecraft windows of a new generation and the International Space Station
- Ion-plasma generators for GLONASS optical solar reflectors
- Diagnostics complex for joints obtained via friction stir welding in manufacturing of spacecraft bodies of a new generation
- Radiopharmaceuticals based on technetium-99, iodine-123, thallium-199 used in early detect ion of oncology and cardiac diseases
- Robot-welder for fuel elements of nuclear reactors

PRACTICE-ORIENTED EDUCATION



- bachelor's programs within CDIO (Conceive, Design, Implement, Operate) Concept
- compulsory course 'Introduction to Engineering Activity'
- design of educational programs and approval of learning outcomes with employers-leading corporations in Russia
- acquiring practical competences through non-professional vocational training, practical internships at the best Russian enterprises
- additional education: over **3000** students annually, **60** professional retraining programs and **250** professional development courses. Customers – over **500** companies and organizations .
- internships of research and academic staff in leading enterprises of Russia and worldwide
- active involvement of students into applied research

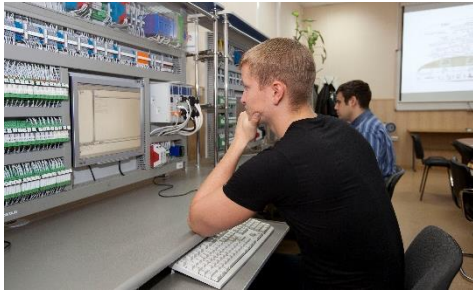


Applied master's programs:

- Petroleum Engineering in partnership with Heriot-Watt University
- Natural Gas Liquefaction in partnership with OJSC Gazprom
- Nuclear Medicine in partnership with Siberian State Medical University and Tomsk Research Institute of Oncology
- Construction of Heat and Nuclear Power Plants in partnership with Tomsk State University of Architecture and Building in the interests of Rosatom
- Information and Communication Technologies in partnership with Skoltech
- Automated Supervisory Control Systems in partnership with OJSC System Operator of the Unified Power System
- Engineering in Biotechnological and Pharmaceutical Industry in partnership with CJSC R-Pharm

ACHIEVEMENTS

- R&D scope in 2015 - over 30 MEuro
- In-house pilot production
- Innovation zone consisting of **80** small innovative enterprises, **48** of which with TPU participation
- 5,000 international students from over 40 countries worldwide. Within QS Ranking TPU holds the 193th position in the world in terms of the number of its international students and domestically only falls behind the People's Friendship University of Russia.
- 6th place in Russia in terms of graduate employability – 95 %
- The biggest number of students' and young scientists' awards for research achievements among technical universities in Russia



RANKING



251–300
(3rd in Russia)



7th position
(the best university
outside Moscow and
St. Petersburg)



481–490
(9th in Russia)



9th position



20
(3rd in Russia)

VLADIMIR POTANIN
FOUNDATION



2nd position

The main objective of our research is to investigate new methods of electron beam diagnostics with longitudinal dimensions in the range of subfemtosecond to attosecond pulses based on polarization radiation.

- to study the generation of coherent polarization radiation and develop new registration systems;
- to develop a generalized theory of coherent polarization radiation;
- to validate the theory through numerical simulations and experimental measurements of spectral and angular characteristics of coherent parametric X-ray radiation and coherent transition radiation from crystalline and amorphous radiators.

One of the objectives to apply for RD51 membership is to develop a multichannel optical readout system based on Thick GEM, wavelength shifter, and an array of MGPDs in a two-phase xenon detector.

- to study the detection efficiency (PDE) of photodiode matrix with wavelength shifter;
- to study and select wavelength shifters to minimize gas contamination;
- to analyze practical application of gas detectors for precision measurements.

Since 2015, a new postdoc has joined TPU (Ivan Alexandrov) - former member of ITEP/MEPhi Moscow group

He participated the experimental demonstration of the operation of a multichannel optical readout system based on ThGEM, a wavelength shifter, and an array of 19 MGPDs in a two-phase xenon detector (joint work of ITEP, MEFHi and Budker Institute)



RD51 TPU TEAM

- Sergey Baydali, group leader
- Alexey GOGOLEV, researcher
- Artem VUKOLOV, researcher
- Ivan ALEXANDROV, postdoc
- Artem OBHODSKIY, researcher

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We plan to develop research links with
Budker Institute of Nuclear Physics