National Research, Development and Innovation Office

Ministry for Innovation and Technology

HUNGARIAN NATIONAL LABORATORY

NATIONAL LASER-INITIATED TRANSMUTATION LABORATORY

DEVELOPMENT OF A LASER NEUTRON SOURCE FOR THE TRANSMUTATION TREATMENT OF NUCLEAR WASTE

The primary objective of the Laboratory is to carry out experiments and simulations on nuclear waste management. Laser-based ion acceleration and neutron generation offers the possibility to decrease the amount of isotopes with long radiation decay time, hence, giving the possibility of relaxing the requirement of deep burial procedure. The generated ions and neutrons can be used for material science, radiobiological, and nuclear photonics researches, which are also assisted by the Laboratory.

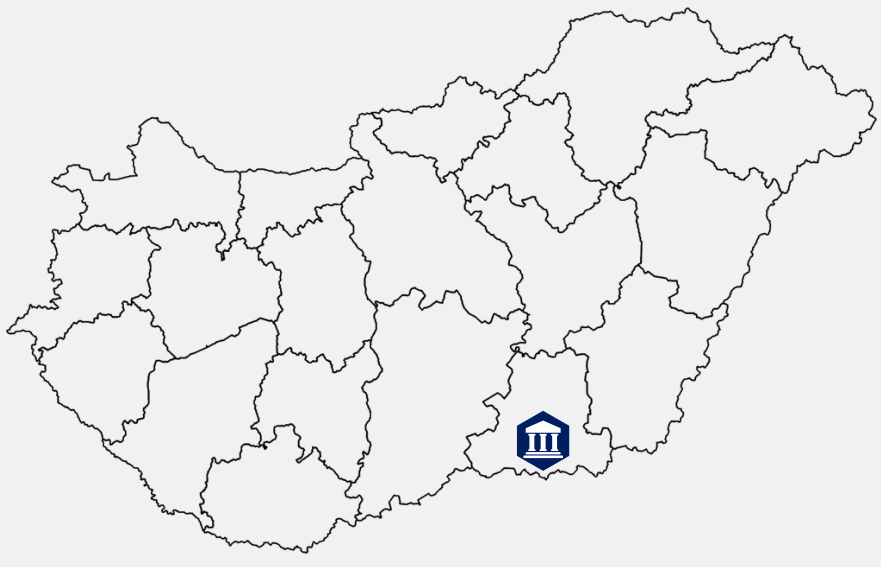
MAIN RESEARCH AREAS

- Laser ion acceleration
- Plasma physics
- Transmutation
- Radiobiology
- Imaging

NLTL National Laser-Initiated Transmutation Laboratory University of Szeged

IMPLEMENTER:
University of Szeged

PLACE OF IMPLEMENTATION: Szeged



CONTACT INFORMATION: physx.u-szeged.hu/nltl nltl@titan.physx.u-szeged.hu

BENEFITS TO BE EXPECTED FROM LABORATORY RESEARCH

- Laser-based neutron source development and neutron diagnostics.
- The production of medical isotopes to replace the cyclotrons needed for PET, which would allow a much wider dissemination of the technique.
- Supplementing the control units used in road and rail freight transport to monitor licensed nuclear materials.

TARGET GROUP

- (Next generation) particle accelerators and their users
- Nuclear power stations and spent fuel (re)processing
- Radiobiology
- CT Imaging
- Nuclear homeland security

THE PROFESSIONAL TEAM

The backbone of the NLTL's technical work, laser particle acceleration and fusion neutron production is led by a senior researcher and an experienced postdoc, besides the project leader. In addition, two full-time foreign researchers, a part-time MSc, and two BSc physics students are working on this part of the project. Two part-time senior researchers and two BSc students are working directly on the high repetition rate target development. A half-time postdoc and a half-time BSc physicist work on the implementation of imaging techniques with the use of the generated particles and hard x-ray. Two part-time postdocs and three MSc students along with a full-time BSc physicist provide the necessary laser development and operation. Three part-time employees provide engineering support. **In total, 21 people are working on the scientific and technical implementation of the project.**

An experienced project management team supports the project leader, including a full-time project manager, a half-time financial officer and a part-time strategic liaison officer to the University of Szeged and the National Research, Development and Innovation Office.

Project leader: Osvay Károly
Károly Osvay was awarded the degree Candidate of Sciences of the Hungarian National Academy of Sciences in Physics for his research results in laser physics in 1995. He habilitated at the University of Szeged (SZTE) in 2011. Founder (1998) and head of the first terawatt laser laboratory in Hungary (SZTE TeWaTi). He spent a total of 8 years in leading international research institutes (RAL UK; Lund University, Sweden; MBI, Berlin). He was the scientific project manager of the ELI-Preparatory Phase between 2008-2011, head of the ELI-ALPS scientific working group from 2011, and research technology director from 2013-2019. His main research interests include ultrafast laser pulse generation and applications, laser-matter interaction, nonlinear optics, and laser particle acceleration.

Leading scientist: Sargis Ter-Avetysian
Sargis Ter-Avetisyan PhD (Candidate) in Physics (Optics) from the Institute for Physical Research of the National Academy of Sciences of Armenia in 1991 (USSR). He worked last two decades in USA, Germany, UK, Czech Republic, and South Korea in a field of relativistic, ultra-high intensity laser plasma interactions: in particular x-ray generation, ion and electron acceleration and their applications; high energy density physics and laboratory astrophysics. As a head of High Density Plasma Physics Laboratory at the Centre of Relativistic Laser Science, Institute of Basic Science (IBS), Gwangju, South Korea, and a Professor in the Department of Physics and Photon Science, Gwangju Institute of Science and Technology, South Korea, he carried out extensive research program on “Ultra-high Intensity Laser Plasma Interactions”, supervise 3 MSc and 2 PhD students. He had research grants from LaserLab Europe (3 topical research grants), International Science Foundation (2 topical research grants) and Copeland fellow in Physics Department of Amherst College, Amherst, MA, USA. He has (co)authored more than 110 papers in peer reviewed scientific journals, received 1500 independent citations, h=23, and holds 1 international patent. He joined the Hungarian, National Laser-Initiated Transmutation Laboratory, University of Szeged, project in 2019 as a Senior Research Fellow.

THE PROFESSIONAL TEAM

Research Fellow: Prashant Kumar Singh

Prashant Singh received PhD in physics from the Tata Institute of Fundamental Research (TIFR), India in 2015. After this as a st Post-doctoral position he joined the Center for Relativistic Laser Science (CoReLS) in South Korea, where he carried out experimental work on particle acceleration and plasma dynamics using one of the most powerful short-pulse, 4 PW laser system. During the second post-doc he joined Los Alamos National Laboratory, USA to work on the laser driven electron fast ignition project. Currently Prashant is working as a Research Fellow in National Laser-initiated Transmutation Laboratory (Uni. of Szeged), where the goal is to produce high flux of few-cycle laser driven neutron beam that can be used for transmutation of nuclear waste and for other fundamental/ applied science. Over the year, he has (co)authored 39 papers in peer reviewed scientific journals, having total citation of 535 and h-index of 14. He is also active reviewer of many Journals such as Physics of Plasmas, Journal of Optics, NIMA, PPCF, and JPhysD.

POSSIBLE PARTNERSHIPS

They seek partners for development of high repetition rate, ultrathin target systems, for characterisation of ultrafast neutron pulses, as well as for industrial applications of laser-generated neutrons.

PROFESSIONAL CONTACT

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Project leader

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