The main research fields and applications at ELI-ALPS

1. The development and parameterisation of attosecond light sources

The ELI-ALPS lasers will generate unique attosecond pulses and pulse trains in the VUV and X-ray spectral regions. Generation, measurement and characterisation of the extreme pulses is non trivial and will require the development of new technologies, optical device and measurement techniques.

2. Biological imaging technologies

High-definition nanometre (10^{-9} m) imaging of functional biological materials in a biological environment is essential to understanding the connection between structure and function in these materials.

3. Medical applications

Energetic ions, generated from secondary sources, will facilitate radiobiological research and contribute to the advancement of cancer therapy.

4. Energy research: from solar cells to artificial photosynthesis

Time-resolved real-time imagery of chemical changes, reaction pathways and kinetics of advanced solar cells and batteries materials and processes will be possible at ELI-ALPS. These time-based processes will have atomic resolution.

5. High-peak power photonics

ELI-ALPS will have a development laboratory environment for developing high-power short-pulse laser systems for industrial partners.

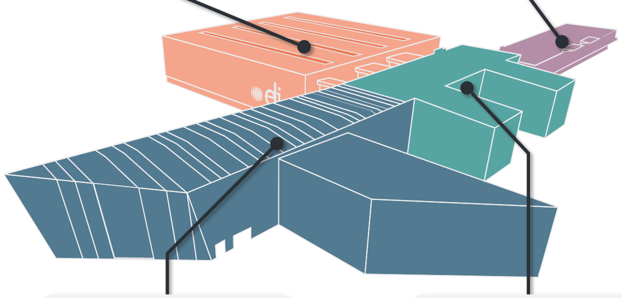
Beyond attoscience, the laser sources of ELI-ALPS would also provide regional and national, basic and applied science projects with experimental opportunities in radiobiology, biophotonics, plasma and particle physics.

The ELI-ALPS Building Complex

The ELI-ALPS complex has been designed to meet the highest demands of experimental scientific research whilst minimising the impact on the local environment. The new building supersedes current building and safety regulations whilst incorporating numerous cutting-edge architectural and building development solutions to ensure that the best framework exists to facilitate scientific research.

Building A - 6209 m^2
Laser technology premises - laser halls and experimental territories

Building D - 2926 m^2
Service supporting multifunctional hall - maintenance and sustainment of the building complex



Building C - 7391 m^2
Host building - offices and rooms with research functions (reception, conference room, library, seminar rooms, management offices, restaurant)

Building B - 7936 m^2
Supplementary scientific offices - laboratories, preparatory workshops, researcher's offices, engineering systems serving building A

eli attosecond

Further information:
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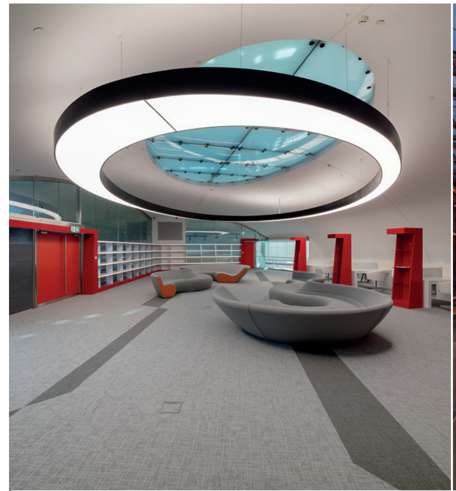
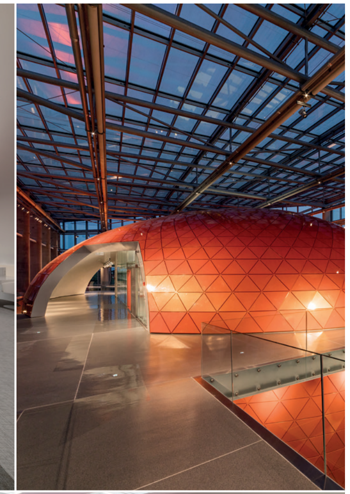


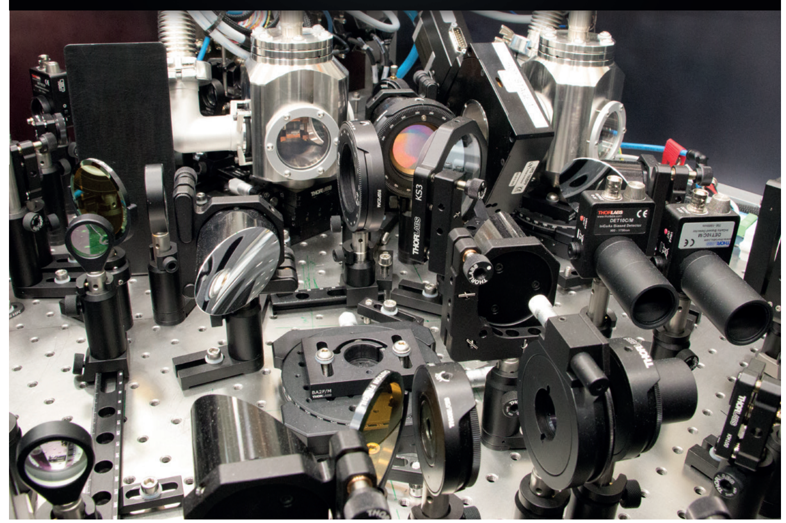


eli attosecond

ELI-ALPS - attosecond light pulse source

Hungary, Szeged

„towards the sharp end of attoscience”



ELI-ALPS, the Hungarian pillar of the Extreme Light Infrastructure, is dedicated to support fundamental and applied researches in physical, biological, chemical, medical and materials sciences at extreme short time scales.

The ground-breaking laser systems together with the subsequent outstanding secondary sources generate the highest possible peak power at the highest possible repetition rate in a spectral range from the E-UV through visible and near infrared to THz. The facility – besides the regular scientific staff - will provide accessible research infrastructure for the international scientific community user groups from all around the world. The first three laser systems, namely the mid-infrared, the Terahertz and the High Repetition Rate lasers are installed and becoming operational, the beamlines are gradually becoming available by 2020.

Attosecond Physics
Ultrashort pulses

Fundamental chemical, biological and physical processes happen very quickly and thus require ultrashort probing techniques. Interactions with attosecond (10^{-18} s) laser pulses would enable the imaging of these ultrafast processes and unlock the understanding of some of the mysteries of natural phenomena.

Laser based photon and particle sources
from THz to X-ray

ELI-ALPS offers more than just the use of the novel class, state-of-the-art laser systems. The unique combination of the outstanding laser pulses with the pioneering secondary sources technologies will open up new opportunities in experimental research.

- The peak power and repetition rate of few cycle phase stabilized lasers systems are ranging from fraction of TW to multi-PW, and 100 kHz to 10 Hz, respectively.
- High-energy extreme ultraviolet photons (10 eV - 10 keV) will be generated via high-harmonic processes in gases and on solids, leading to single pulses with a pulse duration as short as tens of attoseconds.
- X-rays (100 keV) will be resulted from a dedicated relativistic laser-electron Thomson scattering source (available after intensive development phase following 2020).
- THz pulses with even mJ energy are generated via optical rectification in nonlinear crystals.

Initiator of the ELI-project wins Nobel Prize

Gérard Mourou, Professor at École Polytechnique, was awarded the Nobel Prize for Physics along with two other scientists in December 2018 for the development of Chirped Pulse Amplification. This technique takes low-intensity light, stretches and amplifies it, then compresses it back into incredibly shortwith greater power than all the power stations in the world - for a billionth of a billionth of a second. That's a key technology driving the Extreme Light Infrastructure.