

Extreme Light Infrastructure – Nuclear Physics (ELI-NP) A Pan-European Center for Scientific Research

ELI-NP is going to be the most advanced research infrastructure in the world focusing on photonuclear physics studies and applications. As the first large scale European research facility in Romania, the project is likely to become the flagship of the national scientific research, covering frontier fundamental physics, new nuclear physics and astrophysics, as well as applications in nuclear materials management, materials science and life sciences. The implementation of the ELI-NP project, valued at 311 Meuros and financed by Structural Funds and Romanian national budget, will be finalized in 2019.

Selected by the most important science committees in Nuclear Physics in Europe - NuPECC - in the Nuclear Physics Long Range Plan in Europe as a major facility, the ELI-NP infrastructure comprises two main components:

- A very High Power Laser System (HPLS), with two 10 PW ($=10^{16}$ W) laser arms;
- A very intense Gamma Beam System (GBS) with E_γ up to 19.5 MeV, which is obtained by Compton back scattering of a laser light off a very brilliant, intense, classical electron beam produced by a warm LINAC.

At ELI-NP two well-established scientific communities, high-power lasers and nuclear physics, have joined their efforts to build a new interdisciplinary facility and to define its research program.

Based on the unique features of the high-power laser and gamma beams, the scientific program, *ELI-NP White Book*, is the result of a large international collaboration of more than 100 scientists from 30 countries.

The Technical experimental Design Reports of the ELI-NP project (TDRs), associated to each type of experiment were finalized and approved by ELI-NP International Scientific Advisory Board in June 2015, and are published in Romanian Reports in Physics vol. 68 Supplement I, II (2016) (online: www.rrp.infim.ro).

The main research topics are: laser driven nuclear physics experiments, characterization of the laser-target interaction by the means of nuclear physics methods, photonuclear reactions, exotic nuclear physics and astrophysics. In addition to fundamental themes, there will be also applied research with HPLS and GBS.

Radiation induced damage and gamma induced nuclear reactions are major research area in nuclear engineering. Their applications extend from nuclear power plants to medicine and from space science to material science.

Situated in Magurele, only 12 km away from downtown Bucharest, the users of the ELI-NP facility benefit from all of the infrastructures and services provided within the metropolitan area. Magurele has a tradition of more than 65 years of history and development in physics. With more than 3,000 people involved in physics research, its scientific community has become a real partner in the European Research Area, successfully collaborating with and within Large Scale Facilities worldwide and providing scientific and technical expertise in the field.

The ELI-NP pillar is implemented by the National Institute of Physics and Nuclear Engineering Horia Hulubei (IFIN-HH), an institute standing at the forefront of the Romanian science, both in terms of research infrastructures and personnel, addressing a spectrum of

research and development activities in fundamental and applied research including nuclear physics and astrophysics, particle physics, atomic physics, life and environmental physics, theoretical physics, nuclear techniques and advanced communication systems.

ELI-NP has the potential to be, for many years, in the forefront of worldwide science from theoretical physics to biology. The project has a great flexibility to cover various interdisciplinary areas, as a consequence of the possibility to employ, simultaneously in experiments, multiple radiation types, produced by equipment that will be unique at the moment of entering operation.

Once ELI-NP becomes operational, it will be part of a pan-European research institute, ELI-ERIC, endorsed by the European Commission, which will act according to its own regulation and will significantly contribute to the strengthening and promotion of leading European scientific research worldwide.

For more details, please see:
<http://www.eli-np.ro/index.php>