

## **ELI-NP**

### ***The First Laser Nuclear Physics Infrastructure is built in Romania***

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***For its 50<sup>th</sup> anniversary, scientists have selected Romania to build the first laser infrastructure capable of investigating for the first time matter at the nuclear level. It will represent a renaissance for Nuclear physics, for Romania and for the world.***

*May 16th 1960, the first laser shot was fired in the Hughes Aircraft Laboratory. Fourteen Billion years after the Big Bang released the first incoherent light, man created its first burst of coherent light. It was a Copernican event that touched all parts of science, technology and walks of life. During its first 50 years, the laser because of its photon energy and its coherence properties, was ideally fitted to investigate atomic and molecular structure with new tools like nonlinear spectroscopy, quantum optics, cold atoms. They rendered possible the study of the atomic structure and its dynamics with astonishing accuracy.*

*However the laser was quite inefficient in probing the subjacent strata formed by the nucleons and their components, the quarks or to dissociate the vacuum in its elements. Nor the laser photon energy or its electric fields*

were large enough or its pulse duration sufficiently short to conceive pertinent experiments to shed new light on the atom nucleus.

A few years ago a new type of large scale laser infrastructure specifically conceived to produce the highest peak power and focused intensity was heralded by the European Community: the Extreme Light Infrastructure, ELI(1). It was designed to be the first exawatt class laser equivalent to 1000 times the NIF power. This gargantuan power would be obtained by producing kJ of power during 10fs. Focusing this power over a micrometer size spot size will bring forth the highest intensity and give rise to 1) the highest electric field, 2) the shortest pulse of high energy radiations in the zepto-yoctosecond regime 3) electrons and particles with ultrarelativistic energy. With this formidable attributes the laser signaled its entry into Nuclear Physics, Nonlinear Quantum Electrodynamics, Vacuum Physics and in the future Cosmology and Extradimension Physics.

Because of its long standing experience in Nuclear Physics, Romania was selected by the ELI consortium to establish the first Laser Nuclear Physics pillar. This pillar will be built on the Magurele Nuclear Physics site and will draw on the well established expertise necessary to conduct nuclear research.

With ELI-NP, We are now standing on the threshold of a renaissance in Nuclear Physics in which photons may also be used to directly manipulate, excite and even transmute nuclear structure as well as provide new ways to sort out and treat nuclear waste, to secure our environment. ELI-NP, will undoubtedly lead to a watershed in science but also in applications that will benefit society.