

THE EXTREME LIGHT INFRASTRUCTURE – NUCLEAR PHYSICS FACILITY CONSTRUCTION AND OVERVIEW OF THE EXPERIMENTAL PROGRAMME

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The Extreme Light Infrastructure – Nuclear Physics (ELI-NP) facility is under implementation in Romania and scheduled to enter operation by the end of 2018. Two ultra-short pulse, 10PW laser beams and a high intensity gamma-ray beam will form a unique beam combination worldwide. The ELI-NP Whitebook and the Technical Design Reports (TDRs) for the proposed experiments envisage a very wide range of experiments in 8 experimental areas.

The gamma beams generated by the Compton backscattering process of laser photons on an electron beam accelerated in a classical RF linac and will be used for nuclear physics and astrophysics relevant studies, in several experimental setups: Nuclear Resonance Fluorescence, Gamma above neutron threshold, Charged particles detection for astrophysics, Photofission, Positron production, and Industrial applications.

The laser system at ELI-NP will feature three pairs of twin outputs synchronizable in the fs range: 2x10PW, 2x1PW, and 2x100TW. The TDRs describe experiments of high field QED physics, laser driven nuclear physics, and the study of materials in extreme environments. One experimental area will be devoted to experiments of fundamental QED physics with a combination of laser and gamma or electron beams in the same experiment.

A gradual approach in terms of complexity was adopted for each experiment, in order to ensure successful implementation in the preparatory and intermediary phase of this highly challenging project. A description of the present status of the implementation of the ELI-NP project and a summary of the proposed experiments will be presented.