

# ELI ERIC: new capabilities for applications in molecular, bio-medical and material science

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Extreme Light Infrastructure (ELI) is a European Project forming a pan-European Laser facility to provide the most intense femtosecond lasers in the world for fundamental and applied research [1]. ELI European Research Infrastructure Consortium (ELI ERIC) was established on 30 April 2021 to jointly manage operations of three facilities: ELI Beamlines in the Czech Republic, ELI-ALPS in Hungary and ELI-NP in Romania. ELI ERIC founding members are the Czech Republic (Host), Hungary (Co-host), Italy, and Lithuania, with founding observers Germany, Bulgaria and Romania.

The scientific activities of all ELI facilities are based on the utilization of ultrashort pulse lasers with a unique combination of pulse profile, repetition rate, and intensity.

One of the important missions of ELI is to develop a new generation of laser-driven sources for ultrashort pulses covering the ultrabroad electromagnetic radiation range (from THz to  $\gamma$ -ray) based on plasma effects in gases, solids as well as relativistic electron acceleration. All sources have the potential to be used in combination with beams split off from their corresponding drive lasers for pump-probe experiments. In contrast to the situation at accelerator based light sources, like synchrotrons and FELs, the fact that the pump pulse can be split off from the same laser pulse that generates the probe pulse provides an intrinsic synchronization and enables monitoring of ultrafast processes from fs to ms.

Here we introduce the experimental research capabilities offered by ELI ERIC to researchers working in molecular, bio-medical and material science. In particular, we highlight unique infrastructure available at ELI Beamlines facility which is focused on developing the complementary capabilities in optical, VUV and X-ray science in one location, with advanced sample preparation abilities [2]. The complex ultrafast phenomena in solids, liquids or gas phase can be studied utilizing pulsed lasers and laser-driven X-ray sources such as a High Harmonics Generation (HHG) source and a Plasma X-ray Source (PXS). The experimental stations include: Atomic, Molecular and Optical (AMO) Science and Coherent Diffractive Imaging (CDI); Soft X-ray Science; Hard X-ray science (diffraction, spectroscopy and pulse radiolysis); Ultrafast UV-VIS-IR spectroscopy (Ellipsometry, Transient Absorption and Stimulated Raman Spectroscopy).

ELI is thought of as a user facility open to all scientists. Details of how to submit a proposal to carry on experiments using ELI ERIC infrastructure will be also provided.

[1] <https://eli-laser.eu/>

[2] <https://www.eli-beams.eu>

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