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## The ELI Beamlines Scientific Programme

*Friday, 18 April 2025 12:06 (33 minutes)*

The ELI Beamlines Facility is a key pillar of the Extreme Light Infrastructure (ELI) ERIC. ELI Beamlines has developed and operates four state-of-the-art femtosecond laser systems, delivering both high peak and high average power. The facility provides a unique combination of primary (lasers) and secondary (high-energy particle and X-ray) sources.

Laser-driven particle accelerators have gained significant interest due to their cost-effectiveness, versatility and innovative characteristics. This has driven the development of beamlines that allow users to harness the unique parameters of laser-driven particle accelerators—such as ultrashort bunch duration and ultrahigh dose rates—as well as laser-driven photon sources for a broad spectrum of applications.

The presentation will provide an overview of the current performance of particle and photon sources available at the ELI Beamlines user facility, along with their applications in multidisciplinary research. This also includes the combination of optical, X-ray, and particle beams for high-energy-density physics experiments, including research related to inertial confinement fusion. The unique capabilities of laser beam will also be discussed. Furthermore, the high repetition-rate capabilities of both primary and secondary sources will be highlighted, in conjunction with advanced target delivery solutions and diagnostics designed for extreme laser-plasma conditions ( $>10^{21}$  W/cm<sup>2</sup> at  $>1$  Hz).

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