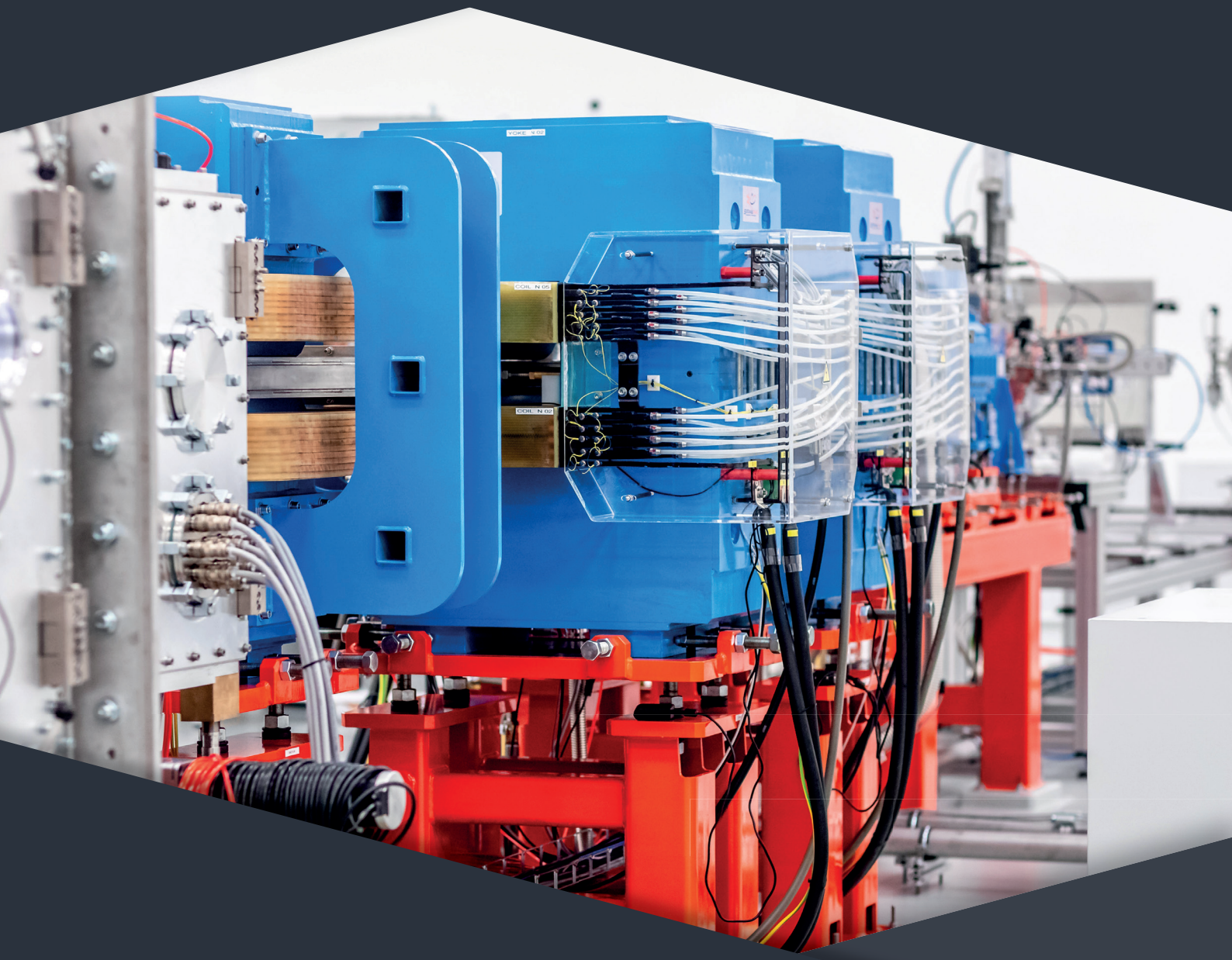
Extreme Light Infrastructure

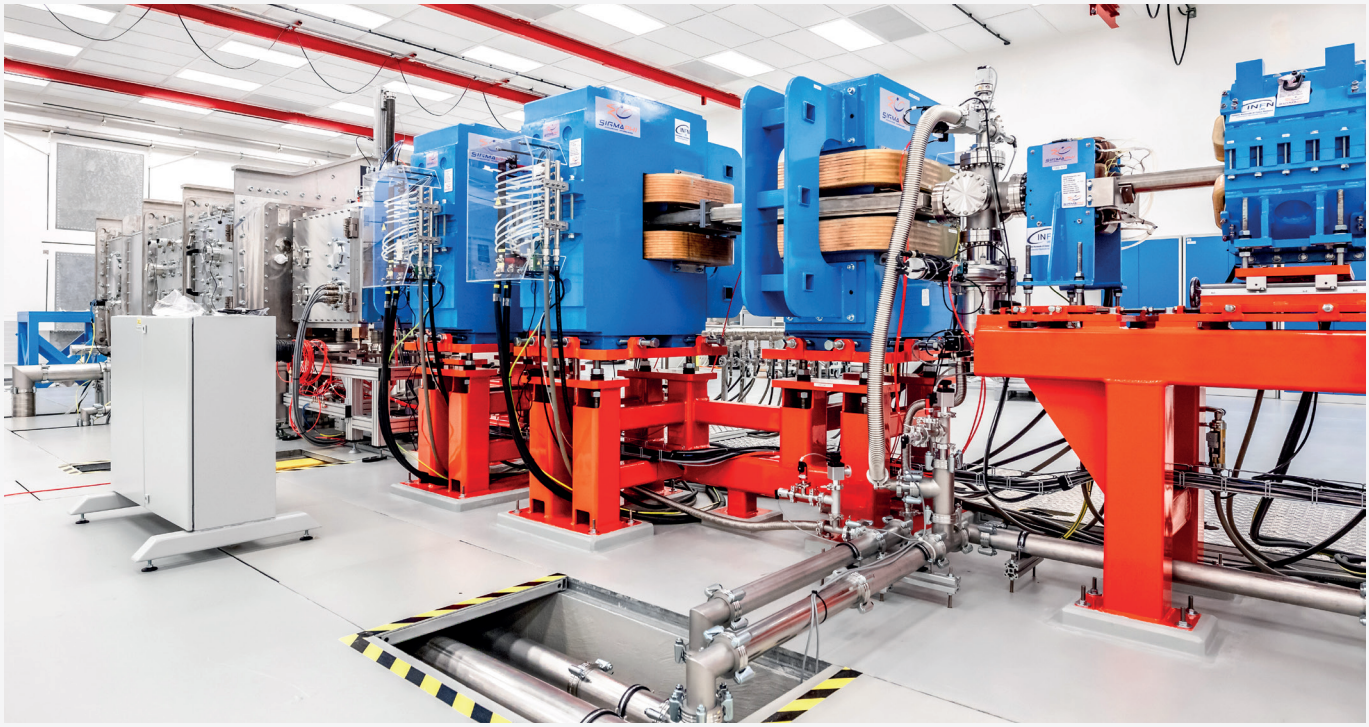


Laser-driven Ion Acceleration

The Extreme Light Infrastructure (ELI) is the world's largest and most advanced collection of high-power lasers. As an international user facility dedicated to multi-disciplinary science, ELI provides access to world-class high-power, high-repetition-rate laser systems and enables cutting-edge research in physical, chemical, materials, and medical sciences, as well as breakthrough technological innovations.

Ultra-short high-energy laser pulses at ELI are used to create plasma with extremely high electric and magnetic fields that allow acceleration of particles at relativistic energies. The generation of stable beams of charged particles with favorable properties and high energies has a wide range of applications.

ELIMAIA, ELIMED



At the ELI Beamlines Facility, the cutting-edge research beamline ELIMAIA (ELI Multidisciplinary Applications of Laser-Ion Acceleration) uses high-power lasers to accelerate ions to high energies. ELIMAIA consists of the laser-plasma Ion Accelerator and the ELIMED section for in-vacuum ion beam transport and monitoring and in-air ion beam dosimetry and sample-irradiation. The ELIMED beam transport line accommodates various diagnostic systems. The accelerated proton/ion beam is shaped in space and in energy according to the specific request coming from the user.

The ELIMAIA beamline is used to develop new technologies for various applications such as radiobiology, cancer therapy, detectors for space radiation, and non-destructive material inspection. ELIMAIA provides beamtime to scientific and industrial users to explore applications of proton/ion beam with unique features, e.g. ultrahigh current and bunch duration (ultrahigh dose rate at the user sample).

ELIMAIA offers a broad range of multidisciplinary applications in different disciplines (medicine, chemistry, material science, etc.). ELIMAIA also offers a PIXE-based system is available for non-destructive material inspection techniques for application in cultural heritage and archeology enabling accurate documentation and verification of ancient and historical artifacts, including test of originality and forgeries.

ELIMED Station	Design parameters (in the sample)
Proton energy	5-60 MeV
Ions/shot	1.10^{8}- 1.10^{10} /sr
Bunch duration	1-10 ns (>10^{9} Gy/s)
Ion beam aperture	~1 deg (FWHM)
Ion beam spot size	0.1-10 mm (FWHM)
Repetition rate	Possible active modulation (1 Hz)

Beamline	User station	Primary source (laser)	Parameters of the laser	Availability
ELIMAIA	ELIMED	L3-HAPLS	1 PW, 30 J, 10 Hz, <30 fs	User-ready

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