Topic: **Development of In-situ Pulse X-ray Diagnostics for Laser-Driven X-ray Sources**

Type of work: BSc. Thesis, Research Project, MSc. Thesis

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Abstract:

Laser-driven X-ray sources, such as those based on betatron radiation and inverse Compton scattering, offer compact, ultrafast, and high-brightness alternatives to conventional synchrotrons or free electron lasers. To fully exploit their potential, reliable in-situ diagnostics are essential for monitoring key X-ray pulse parameters—such as spectrum, divergence, and pointing stability—in real time.

This project focuses on the development of in-situ X-ray diagnostics capable of operating under challenging laser-plasma conditions. The goal is to deliver compact, non-invasive, and high-resolution tools for pulse-resolved characterization without interrupting experimental workflows.

The developed diagnostics will be implemented at the hard X-ray source platforms at ELI Beamlines, supporting a wide range of applications from ultrafast imaging to high-energy-density physics. The student will contribute to the design, installation, and characterization of the diagnostic systems and develop data processing routines to extract relevant parameters from measured signals. In addition, he/she will work effectively with Monte Carlo simulation tools to support design optimization and performance benchmarking. The project provides access to world-class experimental infrastructure, including state-of-the-art laser systems and secondary radiation sources, and offers a unique opportunity to gain hands-on experience at the forefront of laser-plasma and X-ray science.