

Thesis Topic Proposal

Institute of Physics, Czech Academy of Sciences

ELI Beamlines laser centre

Degree Level: Bachelor/Master

Starting date: Upon an agreement

Development of a scintillation detector for pulsed radiation fields

Topic Characteristics/Abstract:

Pulsed radiation fields of extremely short duration ($<10\text{fs}$) are produced during laser-target experiments (LTE) at ELI Beamlines. The intensity and spectral characteristics of the LTE radiation can provide valuable insights into the characteristics of the plasma created at the interaction point. The measurement of such radiation is, however, very challenging due to the unprecedented fluxes of particles emitted from the target. A scintillation detector is developed at ELI Beamlines which employs a novel approach to monitor LTE radiation. Rather than performing single-quanta measurements of the LTE radiation field, it provides shot-by-shot measurements of the field characteristics using a model-driven unfolding.

Further design optimizations using Monte Carlo simulations are necessary to improve the detector performance, namely with LTE radiation of varying energy levels. A new photodiode readout system is under development aiming to improve the scintillation light readout accuracy and reduce the detector dimensions. This work involves the design of a front-end circuit, and the deployment of a live data analysis and data storage platform. In addition, different applications of the detector involving intense radiation fields are explored. Measurements using particle accelerators or X-ray sources are considered.

Scope:

Optimization studies of the detector using Monte Carlo techniques followed by detector integration activities and performance assessment at the ELI Beamlines facility. Development and testing of the photodiode readout system in a LTE context. The exact scope of the project will be adjusted according to the interest of the applicant.

ELI Beamlines

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Application:

Send your application including your CV/Resume and motivation letter describing why are you interested in this particular topic to Ms. Andrea Füst via andrea.furst@eli-beams.eu