Laser diagnostics for a laser-plasma electron accelerator

Bachelor/Master thesis

Abstract:

Laser-plasma accelerators are the new frontier for compact particle accelerators. By using ultrashort (fs) and high-power lasers (TW-PW level) it is possible to accelerate electrons up to GeV energies in few cm distances. However, to fully exploit this potential, the laser parameters at the point of interaction must be fully measured in space and time, and hence optimized to have the highest intensity possible.

The candidate will be integrated and participate in the experimental activities of the Electron Acceleration Group at ELI-Beamlines, where he/she will get both the possibilities to study state of the art laser operation and have a feeling of the researcher life in this field.

He/she will learn how to describe a laser pulse mathematically, have practical experience with laser system, alignment and diagnostics and, in particular, specialize in one aspect of diagnosis characterization. He/she is expected to give a contribution to the implementation of measurement techniques in a real laboratory setup.

Exact work depends on the candidate interest, level of preparation, and on the current experiment running at the time of practice.

Possible topics are:

- Short pulse duration measurement by spectral interferometry
- Spatial profile imaging and focal spot
- Alignment beam installation
- Big optics installation and testing in clean-room environment
- High-resolution imaging of plasma-interaction

No particular software skill is required, except basics software for data analysis and data presentation.

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