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Development of Efficient X-ray Optics for Wider Application of Laser Driven Betatron Sources

Supervisor:

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Laser driven betatron x-ray source has emerged as new source of x-ray to probe the ultrafast phenomenon in material and biological sciences. The ultra-short pulses of x-rays generated in the energy range of a few keV to 100 keV have recently begun to find applications in fundamental studies in condensed matter. For the broader application of the source, a proper way to optimize the number of photons per pulse in the desired spectral range is a must.

A similar x-ray source is under development at ELI beamlines. The source will be open to users from diverse community. Prior to that, in-house development, characterization and optimization of the source will be done. In order to realize the optimization of the number of photons delivered on the sample, an efficient x-ray optics needs to be designed and installed in the beamline.

We propose a project to work in this line of research. The project will involve the design of a proper x-ray optics. This includes numerical simulation of the x-ray optics, communication with the manufacture to develop such optics and finally the installation and online characterization of the optics. The project can be further extended in the direction of several interesting topics such as development of x-ray diffractive optical elements, pulsed x-ray wavefront sensing and shaping. Student will also be allowed to participate in various x-ray diffraction and spectroscopy experiments to be performed at this beam-line.

The project can be established as a collaborative research between the Institute of Physics of the Czech Academy of Sciences / ELI Beamlines and one of our partner labs (LOA, Paris or and INRS, Canada).

Requirement / Support:

Student should be willing to learn the numerical tools used in the design of x- ray optics. Interest in the development of programming (Matlab, C++, Python) skills will be highly valued. A proper guidance and training will be provided to the student in planning and conducting research. Students will be highly encouraged to report their research to prestigious scientific meetings and journals.

The partial employment during the project is possible in the case of active cooperation.

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FZU Institute of Physics of the Czech Academy of Sciences
EUROPEAN UNION
European Structural and Investing Funds
Operational Programme Research, Development and Education
MINISTRY OF EDUCATION, YOUTH AND SPORTS