Open Postdoctoral Research Associate position at École Polytechnique

Laboratory: Laboratoire d'Optique Appliquée (LOA), ENSTA Paris, CNRS,
Ecole Polytechnique, Institut Polytechnique de Paris, 91762 Palaiseau, France
Research group: Ultrafast sources of Particles and X-rays (UPX)
https://loa.ensta-paristech.fr/research/upx-research-group/
Topic: Particle-beam-driven plasma wakefield acceleration
Funding: ERC Starting Grant project M-PAC
Contact: Sébastien Corde, Assistant Professor at École Polytechnique,
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Context

As we push the frontier of particle physics to higher particle energies, conventional accelerator techniques are attaining their limits and new concepts are emerging. The use of an ionized gas —or plasma— circumvents the most significant barrier of conventional techniques by increasing the energy gained per unit length by several orders of magnitude. One class of plasma accelerators, relevant for high energy physics and light source applications, consists in using a particle beam, « the driver », to excite a plasma wave, that can then accelerate the main particle beam. These beam-driven plasma accelerators have made considerable progress in the past few years, with groundbreaking results such as the high-efficiency acceleration of an electron beam [1], the multi-gigaelectronvolt and low energy spread acceleration of positrons [2], and proton-driven electron acceleration [3]. Though these milestones have brought plasma accelerators one step closer to becoming a viable accelerator technology, there is still considerable research needed and fundamental challenges to tackle and overcome.

The position

Within Ecole Polytechnique's Department of Physics, the Postdoctoral Research Associate will join the UPX research group at Laboratoire d'Optique Appliquée (LOA) to work on the topic of particle-beam-driven plasma wakefield acceleration. The primary goal of this

postdoctoral position is to implement and conduct experiments aimed at advancing beam-driven plasma accelerator research and to evaluate the potential of hybrid schemes, combining laser-driven plasma accelerators (also referred to as LWFA), and beam-driven plasma accelerators (also referred to as PWFA), for the production of high-brightness beams and light sources. The work will be performed in collaboration with other major labs involved in LWFA and PWFA research, and therefore the experiments will not only take place at LOA using in-house laser systems, but also at other labs such as SLAC in the US for PWFA experiments conducted on accelerator facility (with the upcoming FACET II facility), and HZDR and LMU in Germany for hybrid experiments conducted on laser facilities. The Research Associate will also contribute to a recently approved experimental proposal for FACET-II, on the topic of electromagnetic beam filamentation instabilities and the associated generation of gamma rays [4]. Depending on the applicant's profile, the experimental work can also be complemented with numerical and theoretical studies.

The Postdoctoral Research Associate position is a two-year appointment funded by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (M-PAC project). The starting monthly salary is negotiable.

Requirements

- PhD in physics
- Research record demonstrating a strong potential for research
- Highly motivated young researcher
- Human qualities to work effectively within a team and coordinate the research with students, postdocs and technicians.
- Experience in either laser and optical physics, particle beam physics or plasma physics is recommended, but not mandatory

How to apply

Applications shall be made by email to Sebastien Corde (sebastien.corde@polytechnique.edu), enclosing a cover letter, a detailed curriculum, a list of publications, and any other relevant documents (e.g. letters of recommendation sent directly from their authors). Applicants not yet holding a PhD degree may be considered provided the PhD defense is expected to take place in a very near future.

References

[1] M. Litos et al., High-efficiency acceleration of an electron beam in a plasma wakefield accelerator, Nature 515, 92 (2014).
[2] S. Corde et al., Multi-gigaelectronvolt acceleration of positrons in a self-loaded plasma wakefield, Nature 524, 442 (2015).
[3] E. Adli et al., Acceleration of electrons in the plasma wakefield of a proton bunch, Nature 561, 363 (2018).
[4] A. Benedetti et al., Giant collimated gamma-ray flashes, Nature Photon. 12, 319 (2018).