Summer 2024 – Undergraduate Research Placement in Plasma Physics

Imperial College London

MAGPIE Pulsed Power Generator

AMPLIFI Prosperity Partnership

Computational placement modelling magnetized plasma diagnostics

@ MAGPIE Pulsed Power Laboratory, Imperial College

Project type: **Computational**	Open to: **Undergraduates (years 2 & 3 preferred*)**
Location: **Blackett Laboratory, Imperial College London, SW7 2BW**	
Duration: **8-10 weeks** **(June-Sept period, dates flexible)**	Bursary: **approx. £400/week (TBC)** funded by EPSRC AMPLIFI Prosperity Partnership with First Light Fusion
Application deadline: **Wed 21st Feb 2024, 5 pm**	Contact: **Dr Stefano Merlini** (sm13118@ic.ac.uk)

*Students must be enrolled in a degree program at the time of the placement (i.e. graduating 2025 or later). 4th year students accepted for 5-year degree programs.

Project description

One of the main challenges of high-energy density research is to measure critical plasma parameters (density, magnetic field, velocity and temperatures) non-intrusively in non-uniform plasmas. A wide range of laser-based diagnostics has been developed at MAGPIE for this purpose, however, density gradients and strong perturbations can severely affect the experimental data, limiting our capabilities to quantitatively characterise these plasma systems. In support to the experimental activities, synthetic diagnostics could help to simulate laser-plasma interaction in highly heterogeneous media, evaluating corrective methods and image processing techniques that could enable the use of laser diagnostics under non-uniform plasma conditions.

For summer 2024 we are looking for undergraduate students to join the MAGPIE team and contribute to the development of synthetic diagnostics. You will be involved in study the propagation of laser light in non-uniform plasmas using an in-house ray tracing code, as well as developing and applying new numerical methods to possibly correct faraday rotation images from shadowgraphy effects. Throughout the UROP placement, you will gain hands-on experience in computational physics, data analysis and image processing. Depending on interest and aptitude, the studentship may also involve performing numerical simulations using magnetohydrodynamic (MHD) codes (e.g. GORGON) and the use of machine learning techniques.

Prior experience in plasma physics is not required, however, you should demonstrate strong computational (Python) and analytical skills, be good at working as part of a large team, and proficient in undergraduate level laboratory and data analysis techniques. To apply, please send us your CV along with a cover letter detailing your suitability and relevant experience.

Further reading

https://www.imperial.ac.uk/plasma-physics/magpie/
http://www.imperial.ac.uk/urop.

[1] S.V. Lebedev, A. Frank and D.D. Ryutov, Reviews of Modern Physics (2019)
[2] Hare, J. D. et. al, Review of Scientific Instruments (2021)
[3] S. Merlini et al, Physics of Plasma (2023)
[4] G. F. Swadling et al, Review of Scientific Instruments (2014)