

Research Studentships for students of a course that does not award an academic degree

Applications are open for 1 Research Studentship(s), within the framework of project/R&D institution (1801P.01600.1.01) 2023.16184.ICDT - IST-ID, financed by national funds through FCT. with the financial support of FCT/MCTES through national funds under the following conditions:

Scientific Area: Plasma Physics a Nuclear Fusion

Admission Requirements:

a) to hold a bachelor or master degree and be enrolled at a course that does not award an academic degree and it is integrated in the educational project of a higher education institution, performed in association or cooperation with one or several R&D units;

b) not to exceed with this contract, including the possible renovations, an accumulated period of two years in this type of studentship, continuously or with interruptions.

Workplan: Month 1 — Foundations, scope and setup

Agree on research questions with supervisor & complete focused literature review. Obtain PIC/QED OSIRIS code access & supercomputer accounts, install and run benchmark test simulations. Prepare project plan and simulation parameter list.

Month 2 — Baseline simulations and model review

Run medium-scale PIC-QED simulations for selected parameter sets; collect diagnostics (particle growth, spectra, density, absorption). Systematically review and compare existing growth-rate and absorption models, noting assumptions and gaps. Develop and test post-processing pipeline for diagnostics and reproducible data storage.

Month 3 — Parameter scans and diagnostics development

Design and execute automated parameter scans (intensity, pulse length, spot size, seed density) on the cluster. Implement advanced diagnostics & scripts: spatio-temporal density growth, particle tracking, momentum-space attractor ID, radiation angular/energy maps. Correlate cascade growth, plasma migration and laser absorption; summarize trends and anomalies.

Month 4 — Model development and refinement

Identify missing physics from simulations (spatial inhomogeneity, back-reaction, attractors) and propose model extensions or semi-empirical corrections. Derive/implement models and fit parameters against simulation outputs. Run targeted simulations to test specific mechanisms.

Month 5 — Validation, uncertainty quantification, and extended simulations

Validate models across wider parameter space including near-future laser scenarios and edge cases. Perform sensitivity analysis and quantify uncertainties/error bars for model predictions. Finalize key figures for results.

Month 6 — Finalization, writing and dissemination

Consolidate results, finalize figures/tables and complete thesis draft (Methods, Results, Discussion, Conclusion). Prepare conference presentation/poster and manuscript outline for a journal. Archive simulation data, analysis



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scripts and documentation (Git + data repository) and submit draft to supervisor. (Present a resume of the activities to carry out, the objectives to achieve, and their relevance for the conclusion of the studies at which the studentship holder is enrolled)

Legislation and Regulations: Statute of Scientific Research Fellow, approved by Law nr. 40/2004, of August 18, as worded by Decree-Law nr. 123/2019, of August 28; FCT Regulation for Research Studentships and Fellowships, available on <https://dre.pt/application/file/a/127230968>.

Workplace: The work will be developed at IPFN-GoLP of IST, under the scientific supervision of Marija Vranic

Duration: The research fellowship(s) will have the duration of 6 months. It's expected to begin when all the bureaucracy is finished, and may be eventually renewed up to the maximum of 12 months, including the duration of the initial contract.

Monthly maintenance allowance: According to the values for Research Fellowships awarded by FCT in Portugal (<https://www.fct.pt/fct-atualizou-o-valor-das-bolsas-para-2026/>), the amount of the monthly maintenance allowance is €1090,98, being the payment method an option of the Fellow by Wire Transfer/Check.

(Note: indicate, when applicable, other financial components, periodicity, and payment method of the allowance)

Selection methods: The selection methods will be the following: *Curriculum evaluation*, with the respective weight of 100%.

Composition of the selection Jury: Marija Vranic, Jorge Vieira e Thomas Grismayer.

Announcement/ notification of the results: The final evaluation results will be communicated to all applicants by email.

Deadlines and procedures of complaint and appeal. A complaint may be lodged from the final decision within 15 working days, or an appeal to the Executive Board of IST-ID within 30 working days, both counted from the respective notification

Application deadline and formalization: The call is open from July 20 until July 31, 2026.

It is mandatory to formalize applications with the submission of the following documents: i) B1 Form – Fellowship application (<https://ist-id.pt/recursos-humanos/bolseiros/#documentos-relacionados>); ii) *Curriculum Vitae*; iii) academic degree certificate, where applicable; iv) proof of enrollment at a course that does not award an academic degree; v) motivation letter; vi) declaration on honour that the applicant does not exceed with this contract an accumulated period of two years in this type of studentship, continuously or with interruptions.

Applications must be submitted to the email: claudia.romao@tecnico.ulisboa.pt



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