Indian Institute of Technology Delhi

School of Interdisciplinary Research (SIRe)

SIRe Project Number

2025-01-36

(will be assigned by SIRe)

Project Proposal for Ph.D.

Project Details (The research problem must clearly indicate the need for an interdisciplinary approach)	
Project Title	Fluctuation induced plasma transport in linear double plasma device.
Project Summary (Minimum 500 and maximum 2000 characters)	In general laboratory plasmas whether magnetized or un-magnetized are mostly quiescent and having parametric profile uniformity in both radial and axial directions. However, it depends on the mechanism by which the plasma is produced viz. filamentary, rf-driven (inductive or capacitive), microwave etc. several times it has been observed that the laboratory plasmas produced in cylindrical linear machines are having radial gradients in plasma parameters such as gradients in density, temperature and plasma potentials. These gradients are in turn becomes the free energy sources for exciting local parametric fluctuations in the system that further leads to waves and instabilities. Controlled experiments in laboratory can mimic similar situations like magnetospheric space plasma and their diagnostics focusing towards plasma waves, instabilities, turbulences, wave – wave interaction, wave plasma interaction studies and turbulence induced plasma transport are still burning subjects in the plasma community. Here, the linear machines play a significant role in diagnosing the above subjects using fundamental diagnostics like Langmuir probes, emissive probes, flux probes etc. The aim of the project will be 1) producing parametric gradients in the linear plasma device and excite the fluctuation driven waves and instabilities and 2) launch an electromagnetic wave from an external source and study their coupling to the plasma as wave plasma interaction studies related wave breaking or higher harmonic generation studies.

Ph.D. Supervisors
(Supervisor 1 and Supervisor 2 cannot be from the same department of IITD)

Role	Name of Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Debaprasad Sahu	Department of Energy Science and Engineering	dpsahu@dese.iitd.ac.in
Supervisor 2	Dr. Amulya Sanyasi	IPR, Bhat, Gandhinagar	amulya@ipr.res.in

Project requirements (Student qualifications, experience required, etc)
***The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)**

- B. Tech. in Electrical Engineering or M. Tech. Electronics and Instrumentation Engineering or B. Tech. in Electrical Engineering. M. Sc. (Physics) students may also be considered, if found suitable.
- Some knowledge of design and fabrication of electrical and electronic circuits is preferable.

Source of fellowship/funding and project number
(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)

Candidate with his/her own fellowship /institute assistantship

Role of Faculty Members involved:	
Supervisor-1	Setting up the double plasma machine and associated components for the required experiments
Supervisor-2	Diagnostics development, data capturing and data analysis in collaboration with Supervisor 1.