Indian Institute of Technology Delhi

School of Interdisciplinary Research (SIRe)

SIRe Project Number
2024-01-08

(will be assigned by SIRe)

Project Proposal for Ph.D.

Project Details	
Project Title	Nonlinear dynamical characterization of a low-temperature plasma source
Project Summary (Minimum 500 and maximum 2000 characters)	Plasma being a highly complex medium with an inherent ability to self-organize itself against external perturbations and maintain its quasi-neutral nature, tends to trigger nonlinear features in different types of dc/rf/μ-wave/ECR plasma sources, especially near to the transition regions of plasma discharges. Plasma Lab at IIT Delhi has been developing and characterizing different types of plasma sources with focus on different applications during the past few decades. Some of the nonlinear characteristics that have been observed in its sources include ion acceleration across a null point in ECR based plasma thruster, rotating anode glow balls in dc discharges and nonlinear power coupling regimes in rf discharges for which one would need non-linear dynamical tools to characterize them and solve a set of non-linear particle and power balance equations to model the same. This research problem would attempt to address one such interesting feature viz., the rotating anode glow triggered in dc discharges using afore-mentioned tools. Further, synchronization studies would also be carried out by coupling two such distinct rotating anode glow discharges and study the effect of different operating parameters using nonlinear tools.

Ph.D. Supervisors

Role	Name of Faculty		Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1	Ramesh Narayanan		Department of Energy Science and Engineering, Indian Institute of Technology Delhi	rams@dese.iitd.ac.in Mob.: +91-9654034235, EPABX 1250 (O) / 6531 (L)
Supervisor 2	Vikrant Saxena		Department of Physics, Indian Institute of Technology Delhi	vsaxena@physics.iitd.ac.in Mob.: +91-7043594300, EPABX 1392 (O)

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

- M. Sc. In Physics or M. Tech. in Instrumentation
- exposure to electronics and / or vacuum systems may be preferable?
- Has some knowledge of numerical techniques?

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

Institute fellowship/ Project fellowship.

Role of Faculty Members involved:

Supervisor-1	➢ Prof. Ramesh Narayanan (DESE, IIT Delhi) will mentor the student on the development and characterization of the discharges triggered in low-temperature plasma sources for nonlinear studies
Supervisor-2	➢ Prof. Vikrant Saxena (Physics, IIT Delhi) will mentor the student to understand the theoretical physics concepts of such discharges