

Project title: Electrostatic space thruster

Advisors: Drew Ahern (PhD student in AE) and Prof. George Miley (NPRE)

Project description:

The Helicon Injected Inertial Plasma Electrostatic Rocket (HIIPER) is a space propulsion method consisting of a helicon plasma source and grid elements from inertial electrostatic confinement (IEC), a fusion concept. In HIIPER's configuration, IEC grids are proposed to function similarly to the grids of an ion thruster, which extract and accelerate ions from a discharge. Additionally, in prior experiments, specially-made IEC grids have been shown to emit a beam of electron-dominated plasma. This same behavior is being studied here, where electrons would function in neutralizing any ions being extracted. Having a neutralized exhaust is beneficial over traditional ion and Hall thrusters that require a separate electron emitter. To study this, a retarding potential analyzer (RPA) is being designed to measure ion and electron energies at the exhaust of the system for different IEC grid configurations. Additionally, an RF-compensated Langmuir probe and a Mach probe are being constructed to measure the performance of the helicon source by itself. To supplement these experiments, the computational tool COMSOL Multiphysics is being used.

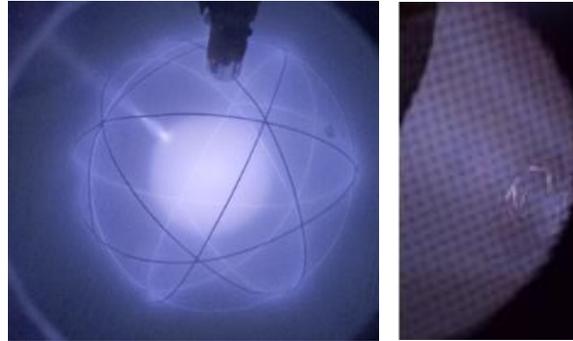


Figure 1. Left: IEC grid operating in glow discharge mode (generating its own plasma in an earlier test). Right: present operation with a helicon (not shown) feeding plasma to an IEC grid system.

Student background and expected research activities:

We are seeking students interested in creating and running space propulsion experiments. Interested students should be comfortable with hands-on work or should be highly willing to learn. Prior lab experience is preferred but not necessary. Typical activities will include setting up experiments and assisting in the running of these experiments, as well as some computational work.

Points of contact:

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