

Professor Name

KAWASHIMA Rei (Mr.)

Laboratory name

Space Electric Propulsion Laboratory

Laboratory Website

<https://www.sepl.ee.shibaura-it.ac.jp/>

Keyword

Space Engineering, Plasma, Computer Simulation

Program period

More than 2 months

Desired skills (Preferred skills)

Knowledge of mathematics and physics.

Eligibility-school year

- Bachelor 3rd
- Bachelor 4th or higher
- Master 1st
- Master 2nd
- PhD 1st
- PhD 2nd
- PhD 3rd

Eligibility-student's major/fields

- Mechanical
- Chemistry
- Material
- Electrical
- Electronic
- Computer Science
- Life Science
- Mathematical
- Civil Engineering
- Architecture
- Engineering and design
- Other

Tasks in the laboratory

#### 1. Plasma Candle

Cross-field discharge plasma is known as an efficient plasma source using an ExB configuration. The discharge plasma ablates the solid material, and the sublimated gas serves as the operating gas for the discharge. The intern's task is to examine the operating conditions of an imaginary ExB plasma device in which the discharge plasma is maintained using the solid ablative material. The characteristics of the discharge plasma will be analyzed using a one-dimensional or two-dimensional plasma model, which will incorporate the interaction between the discharge plasma and solid ablative material. The goal of this study is to numerically or experimentally demonstrate the sustained discharge with the solid material. The resulting discharge plasma will be a new type of plasma candle. The program will be implemented using Fortran and Matlab.

#### 2. Plasma flow simulation under magnetic field

The intern student is supposed to conduct a plasma flow simulation under various strengths of the applied magnetic field. The relationship between the plasma flow behavior and magnetic field geometry is investigated by a particle-in-cell simulation. The program will be implemented using Fortran and Matlab.

#### 3. Particle simulation of rarefied ions around Electrostatic Filter

A new device called the 'Electrostatic Filter' is under development for application in vacuum systems. This device, employing an electric field on a multilayer grid system, enables the smooth flow of ions from one side while limiting the flow of neutral gas from the other side. The intern student is supposed to develop a particle model to simulate the ion transmittance and neutral atom reflectance of the electrostatic filter. The program will be implemented using Fortran and Matlab.