



**Master Thesis Work**

of Mr. Name, Surname

**Experimentelle Untersuchung des Entladungsverhaltens einer trägen elektrostatischen  
Einschlussplasmaquelle mit laserinduzierter Fluoreszenz**

**Experimental Investigation of Discharge Behaviour of Inertial Electrostatic Confinement  
Plasma Source with Laser induced Fluorescence**

Motivation:

The inertial electrostatic confinement (IEC) is an advanced plasma concept which was developed in 1960s. The nature of the discharge is unique from the other plasma source. Yet, the understanding of the discharge behaviour regarding to plasma production is not clear due to its complex physics and configuration. Since 2017, a spherical double layer theory is proposed in IRS to explain this complex discharge phenomenon. A lot of experimental campaigns have been conducted at IRS with the purpose to promote the application of IEC in both industrial plasma processing as well as space propulsion. The development currently undergoes several different plasma diagnostics tools to decipher the extracted plasma properties.

To further investigate the ion production in the IEC discharge as well as understand the ion kinetic energy without disturbing the plasma or discharge, an adequate non-intrusive diagnostic method should be implemented. Laser induced fluorescence is ideal for the investigation of the ion density and velocity. The working principle of Laser induced fluorescence is to pump a laser beam to trigger the orbiting electron of a heavy particle from one state into an upper state. The spontaneous decay of the electronic state releases a narrow bandwidth radiation. Measure through a spectrometer/monochromator, the intensity of the radiation as well as its broadening effect could be observed. This information could serve as the basis to interpret the ion density and velocity of the ion species.

The mission of this thesis is to design, develop, and setup laser induced fluorescence for IEC discharge measurement. The student required strong knowledge in the plasma physics, laser spectroscopy, and inertial electrostatic confinement. In addition, the student is required to design the test plan and identify the respective equipment and components for the LIF facility. Last, the setup has to be built up and a test campaign for the IEC has to be implemented.

Task summary of the Master thesis work:

- Literature review of plasma physics, laser spectroscopy, and inertial electrostatic confinement theory
- Evaluation and design of the LIF facility
- Order and setup the LIF facility
- Implement LIF setup for IEC investigation
- Documentation of the work in English.

Supervisor: Dr. Georg Herdrich, Mr. Yung-An Chan

Starting date: anytime

Submission until: six months later

**Acknowledgement of receipt:**

I hereby confirm that I read and understood the task of the master thesis, the juridical regulations as well as the study- and exam regulations.

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PD Dr.-Ing. Georg Herdrich

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Signature of the student

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