

Development of a Laser Induced Fluorescence Diagnostic System for Hall Thruster Plasmas

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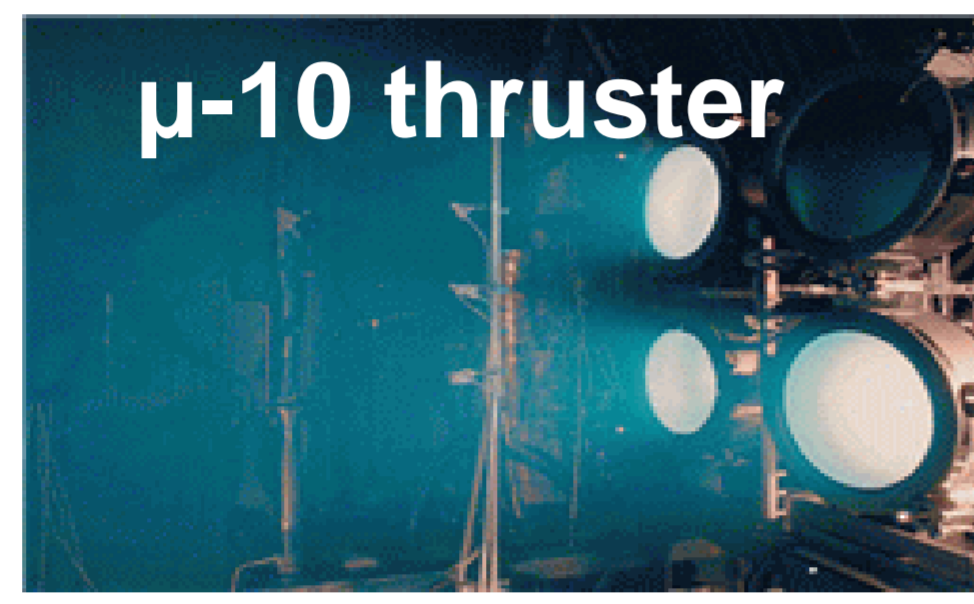
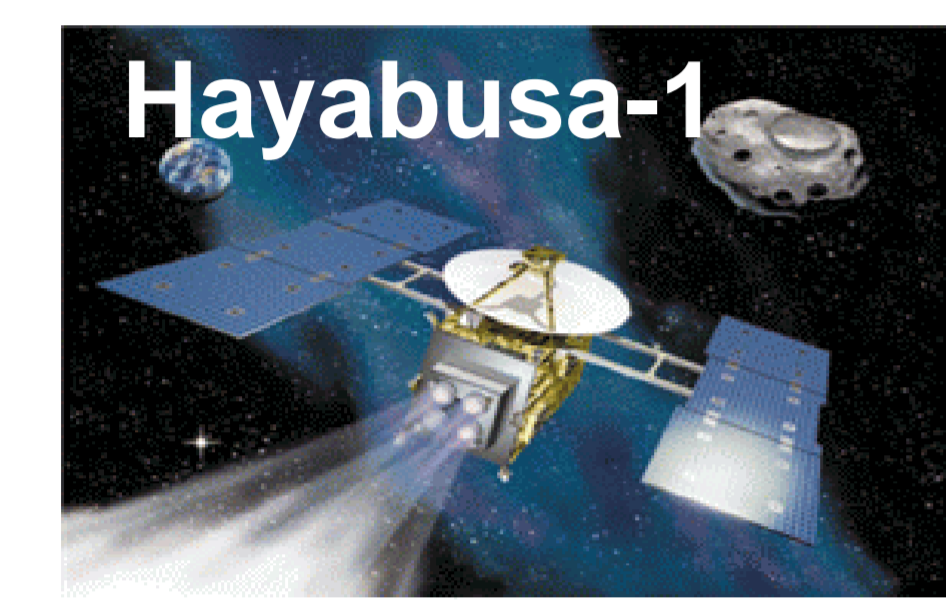
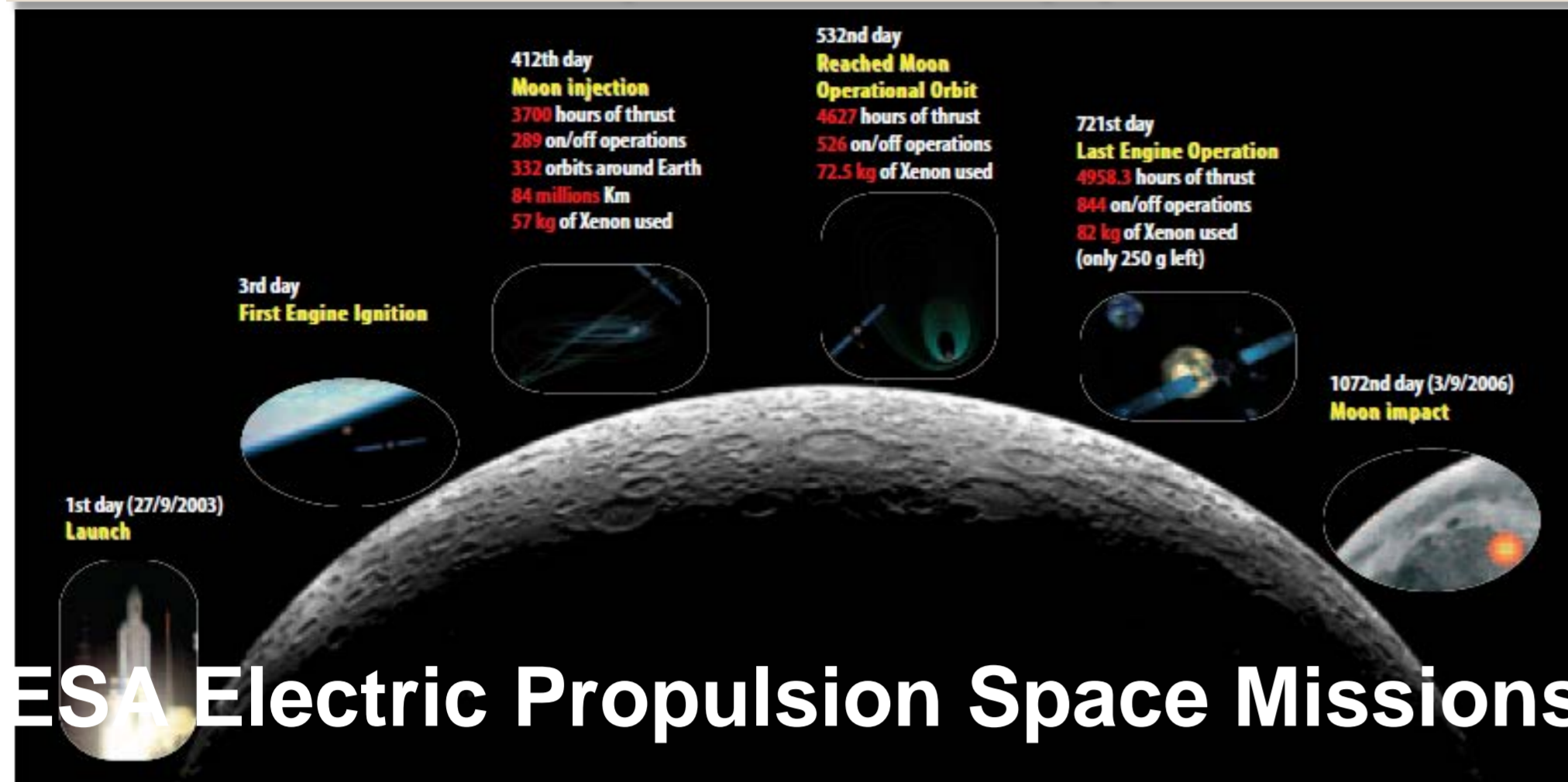
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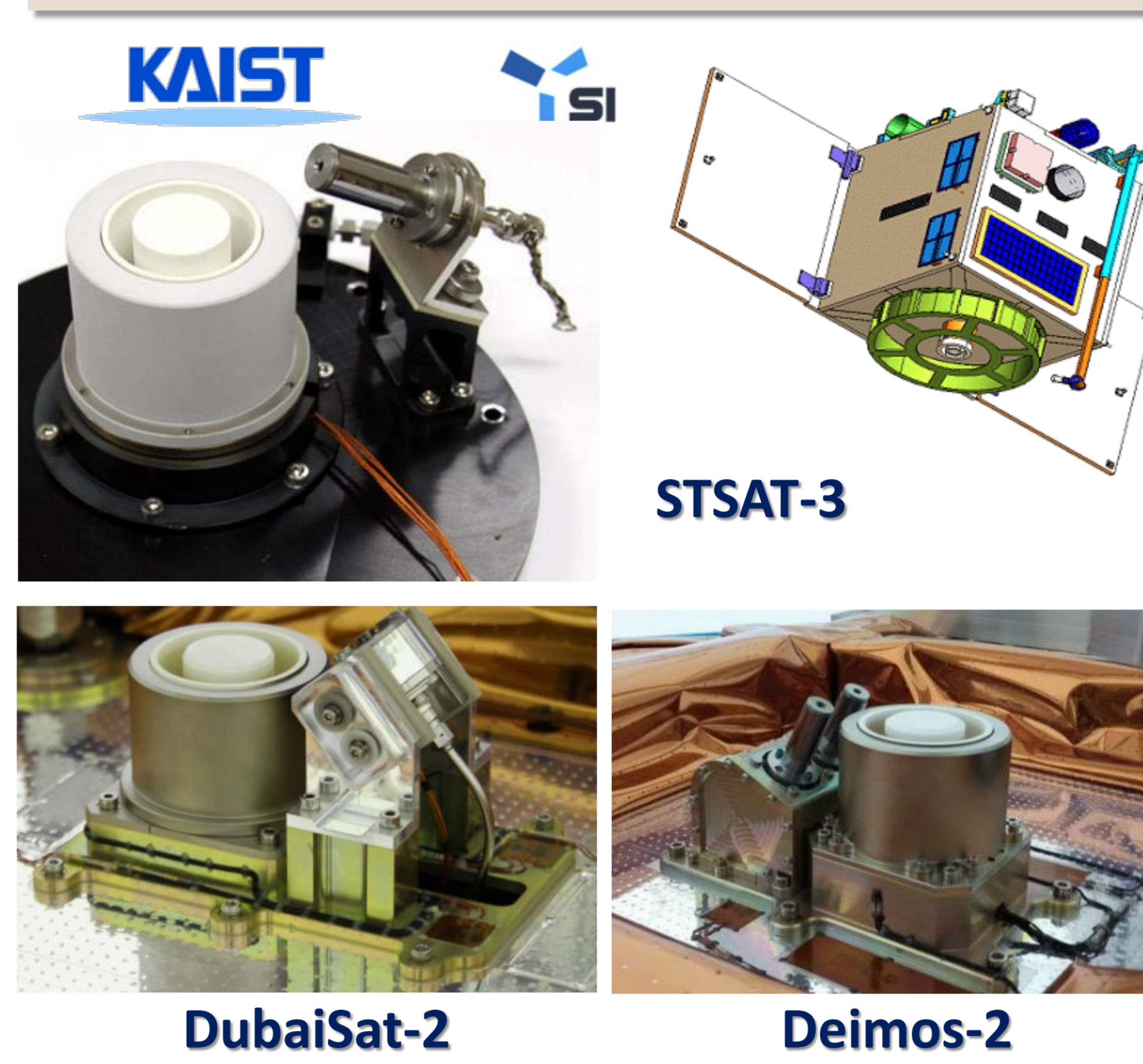
GDPL
KAIST Gas Discharge Physics Lab

Electric Propulsion and KAIST R&D

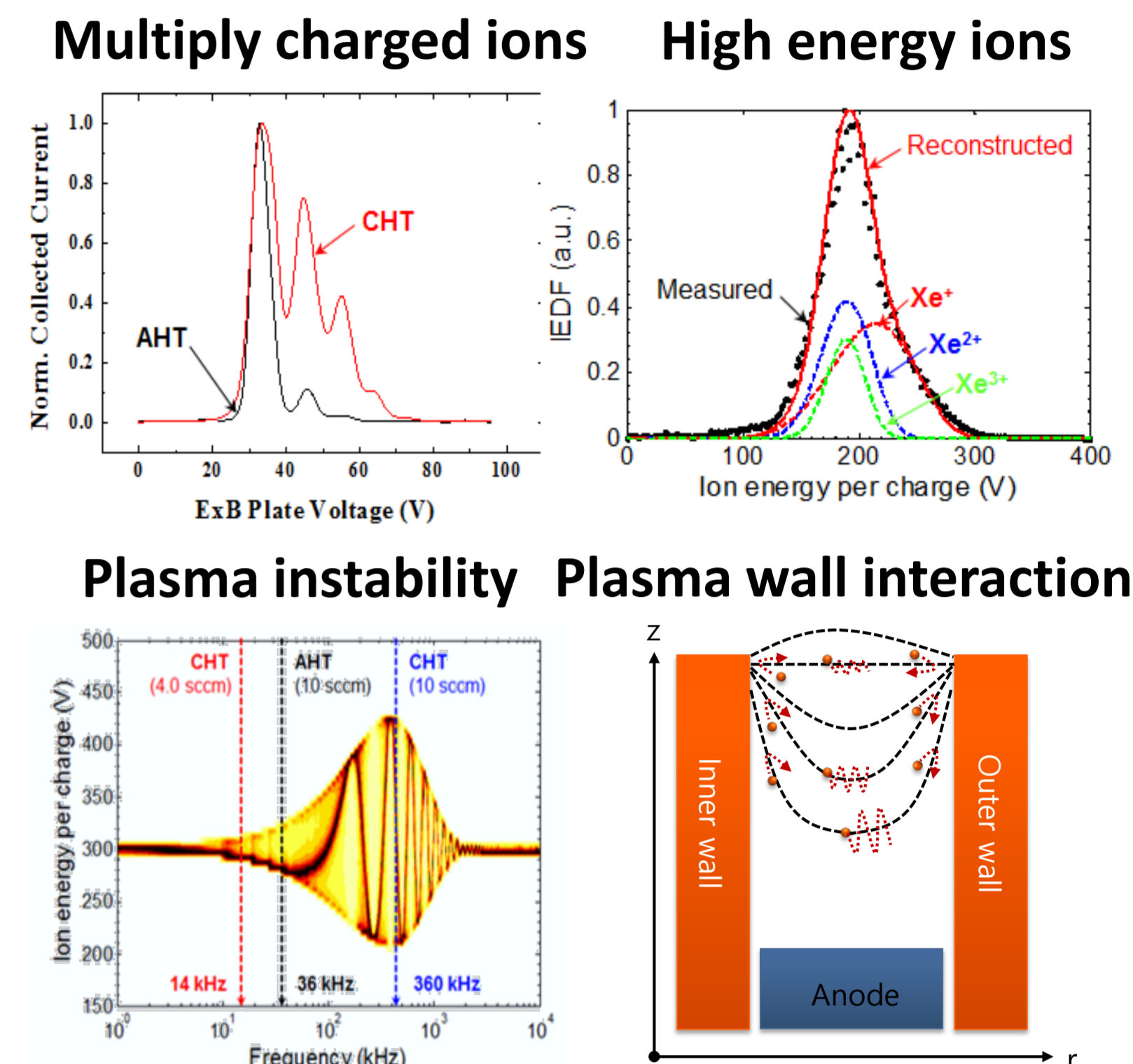
Electric Propulsion Applications



3 Korean LEO Satellites in Orbit



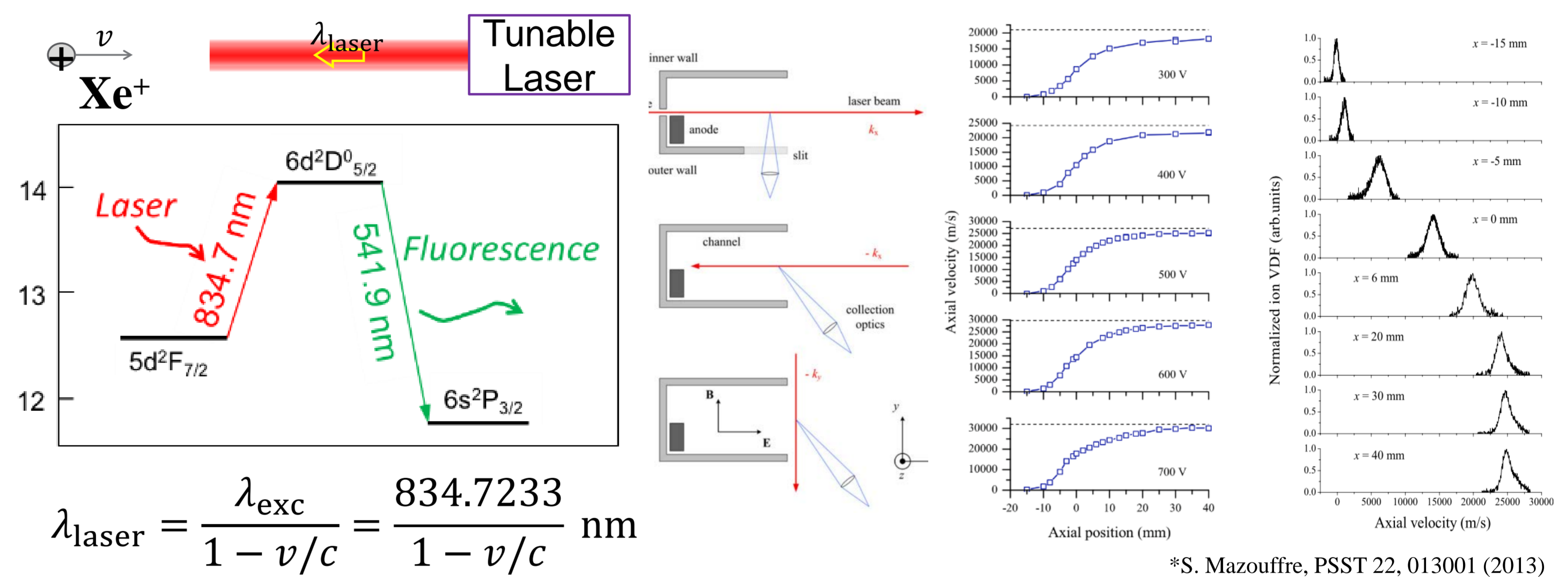
Fundamental Physics Research



Laser Induced Fluorescence (LIF) Diagnostics

- Plasma characteristics have been investigated using various diagnostics (e.g. Faraday, RPA, ExB etc), however, mostly outside the channel due to high energetic ions.
- LIF is a powerful diagnostics to obtain important physics information including plasma potential and 2-D ion acceleration profiles, which are related to our recent research (wall interaction, high energy ions, multiply charged ions etc).

Ion Velocity Distribution Function Measurement

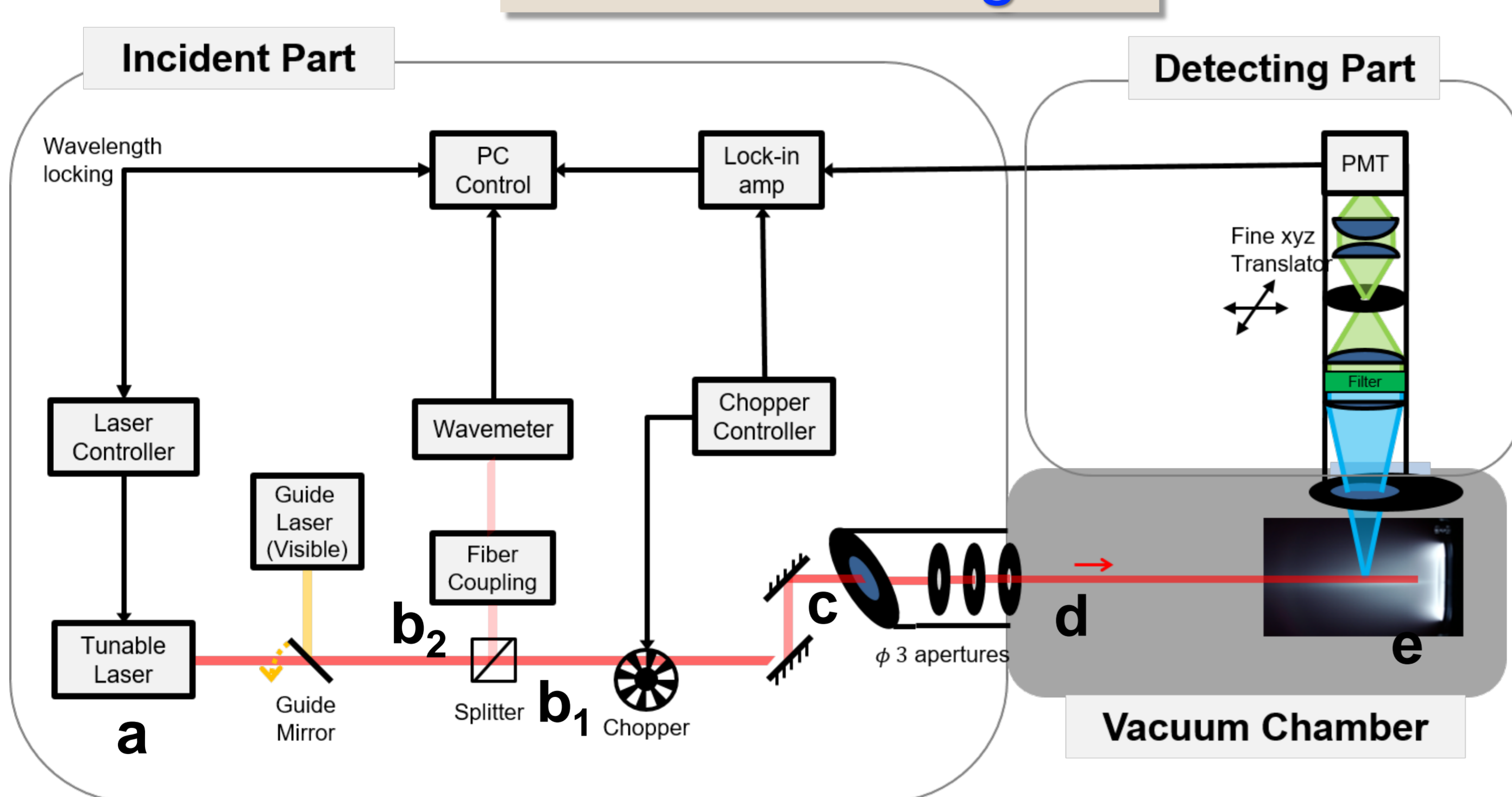


$$\lambda_{\text{laser}} = \frac{\lambda_{\text{exc}}}{1 - v/c} = \frac{834.7233}{1 - v/c} \text{ nm}$$

*S. Mazouffre, PSST 22, 013001 (2013)

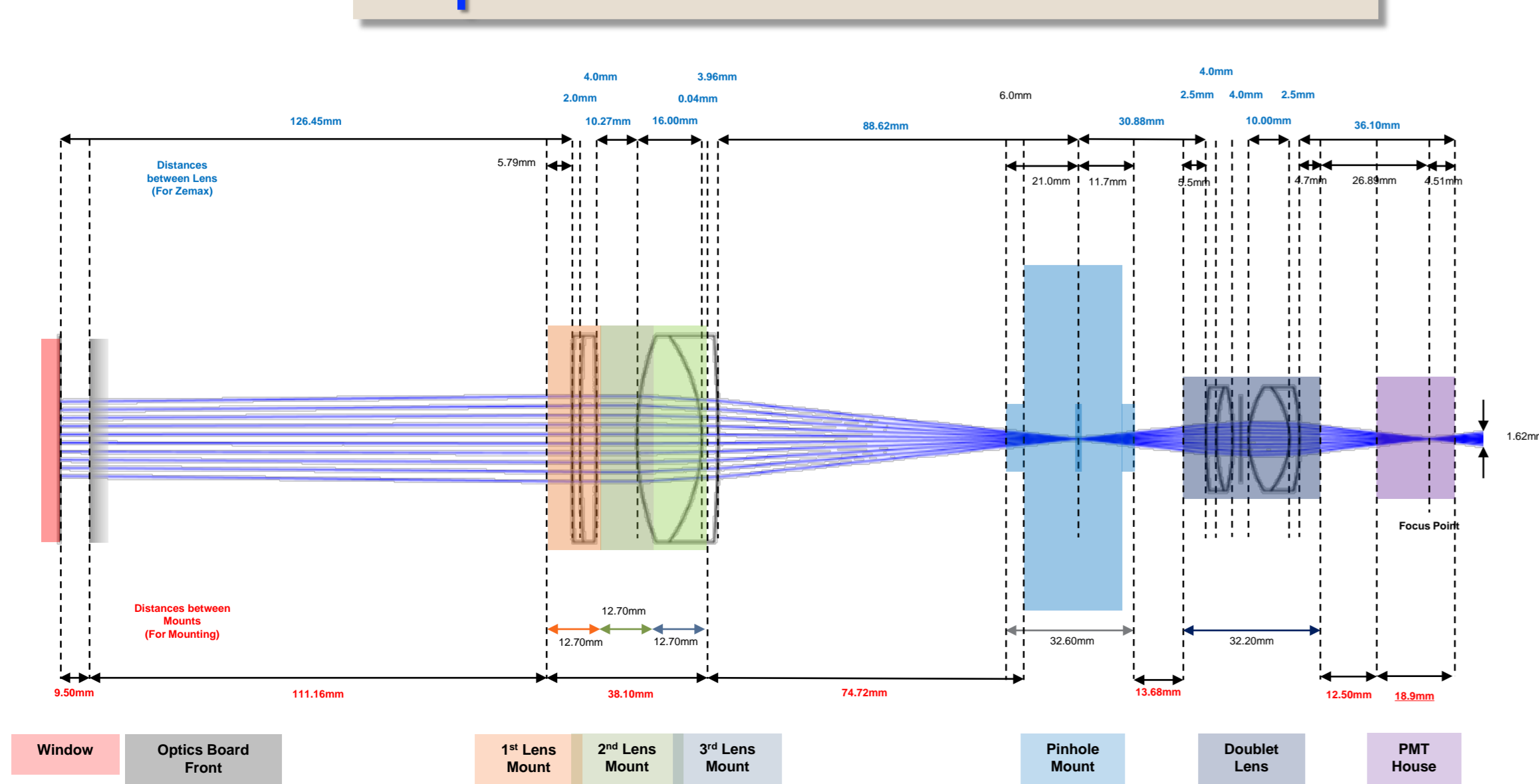
LIF System under Preparation

Schematic Diagram



- The LIF system consists of a tunable diode laser (834.72 nm, Mode hop free tuning: 50 GHz, 90 mW) and a wavemeter (700-1650 nm, accuracy: 1 pm).
- Optical path was demonstrated by computer calculation and components were aligned by using a visible laser.
- Difficulties:
 - Large focal length (1 m) to get signals outside vacuum → Not enough fluorescence (541.9 nm) by the laser
 - Strong fluorescence (541.9 nm) without laser → Hard to distinguish the fluorescence
 - Using lens with short focal length (< 1 m) and increasing laser power could be an alternative.

Optical Path of Detector



Alignment of Detector

