

SPACE PROPULSION SYMPOSIUM (C4)
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PLASMA DIAGNOSTICS OF THE MU10 MICROWAVE ION THRUSTER

Abstract

Two optical fiber measurement techniques are used in this paper to reveal the physical mechanism of the enhancement of the thrust force of the $\mu 10$ electron cyclotron resonance (ECR) ion thruster. The beam current of the $\mu 10$ thruster was increased in previous studies by changing the propellant injection method. In this study, in order to observe the difference in plasma distributions, optical fiber probes were inserted into the thruster under beam acceleration. The first measurement was laser absorption spectroscopy. By traversing the optical fiber, the number densities of an excited neutral xenon were obtained along the center axis. The second measurement was an electric-optic element probe measurement conducted to measure the intensities of the microwave electric field. Both measurements suggest that there is plasma in the waveguide in the conventional model of the thruster. This phenomenon is possibly caused by the leakage of electrons from the ECR region to the waveguide. As a result, this paper concludes that the suppression of plasma in the waveguide is a very important measure to improve the performance of microwave thrusters.