Radiofrequency Resonant Cavity Thruster Research Project

Abstract
In order to meet the needs of new and more ambitious space missions, a new form of space propulsion must develop. The method of propulsion with the greatest potential to influence the space industry is the RF Resonant Cavity Thruster. This thruster is a new type of technology that was developed by Roger Shawyer and Guido Fetta as a way of producing small amounts of thrust without any onboard reaction mass. This project focuses on learning from the experiments conducted by NASA and the Chinese on this form of propulsion to design and build a new version of the thruster. These previous results and conclusions, combined with other equations and design methodologies for building a resonant cavity/waveguide will be used to design a different variation of thruster. The research is primarily focused towards a conceptual design project over the next year, but there is potential to build and test the device. The research is based on topics such as resonant cavity/waveguide particle accelerator design, quantum mechanics, and superconductivity.

Hypothesis
Are RF Resonant Cavity Thrusters a feasible method of propulsion? If so, is there a better way to produce more thrust than has already been seen in previous experiments?

Although the previous tests of radio frequency resonant chambers have produced minimal thrust, this is primarily because the chambers have been designed and built only as proof of concept. The purpose of this research project will be to take the this concept and optimize it to prove the viability of the technology. The optimization will focus on the equations behind the design, which stem from waveguides and pillbox cavities, and the material with which the chamber is made. Different techniques will also be utilized to power the device compared to conventional methodologies.