

Public Abstract

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Title:The Ferroelectric Plasma Thruster

Satellites are used for many purposes including communication and scientific research. As the requirements for these fields become more demanding, improvements are necessary for the underlying technologies. One technology is the mechanism for altering the position of the satellite: micropropulsion. Very fine adjustments require very small forces applied to the satellite. In addition, as satellites decrease in size and mass, high efficiency is necessary. The Ferroelectric Plasma Thruster (FEPT) is a new micropropulsion technology which was developed at the University of Missouri to increase the operating range of satellites.

After proving that the proposed concept of the FEPT does produce ions, one component of the transfer of mass needed to produce thrust, two characteristics of the FEPT were directly measured: thrust and specific impulse. Because the thrust generated by the FEPT is so small, a thrust stand was designed, built, and characterized. The thrust generated by the FEPT was found to be $\sim 80 \text{ } \mu\text{N}$ (0.000011 pounds; about one-hundredth the weight of one paper clip). Specific impulse is a quantification of the velocity of particles emitted from the thruster. The velocity of ions was measured to be $\sim 5,880 \text{ m/s}$ (over 13,000 miles per hour). Both of these parameters were measured when the FEPT was only utilizing a power of less than 8 Watts.

In addition to use in micropropulsion, the FEPT was found to be able to produce plasmas in atmospheric-pressure backgrounds. This may be important for future use in the fields of plasma-processing. Plasmas are used extensively in semiconductor manufacturing.