

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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MAGNETIC FIELD TUNING DURING THE TESTING OF STATIONARY PLASMA THRUSTER

Abstract

The next generation, high power communication satellite of Indian Space Research Organization (ISRO) will be using Stationary Plasma Thruster (SPT) based Electrical Propulsion System (EPS) as backup and augmenting the chemical propulsion system. At Liquid Propulsion Systems Centre (LPSC) in ISRO, a high efficient SPT operating at about a power level of 1.0 kW is being developed. The engineering model of the thruster was developed and successfully tested for duration of 100 hours at the EPS test facility of LPSC in Bangalore. The present day technology knowledge in the area of SPT like physics of plasma acceleration, ionization process and effect of magnetic field on the efficiency of thruster etc is mainly based on the experimental study. There is no straightforward design calculation, design equations etc for the development of SPT. Hence extensive experimentations were carried out before finalizing the various design parameters like operating voltage, mass flow rate, magnetic field strength etc. The thruster magnetic field tuning is very important before finalizing the thruster operating parameters. A non optimized thruster magnetic field will influence the discharge current oscillations which may be detrimental to the thruster life time. In the present study experimental evidence is presented wherein the non optimized magnetic field changes the thruster operating regime during the thruster firing. The discharge current oscillations were captured and the changes in the frequency are highlighted. The thruster magnetic field distribution for various magnetic coil currents were simulated and presented. The magnetic field was tuned for the operation of thruster at higher discharge voltages by measuring the thruster performance and studying the pattern of discharge current oscillations.