

IAF SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (1) (5)

Author: Mr. Harshit Gole
Indian Space Research Organization (ISRO), India

Mr. Aditya Raj Sinha
Indian Space Research Organization (ISRO), India

Dr. Vara Prasad Kella
Indian Space Research Organization (ISRO), India

Mr. Shibu Mathew
Indian Space Research Organization (ISRO), Liquid Propulsion Systems Centre (LPSC), India

Mr. Raji George
Indian Space Research Organization (ISRO), India

Mrs. Abarna V
Indian Space Research Organization (ISRO), India

Mr. K M Shanbhogue
Indian Space Research Organization (ISRO), India

Dr. Sunil kumar S
Indian Space Research Organization (ISRO), India

PARAMETER OPTIMISATION AND PERFORMANCE EVALUATION STUDIES ON A 5KW HALL
THRUSTER**Abstract**

Electric Propulsion has been showing significant benefits over chemical propulsion for geosynchronous satellites. World over, hall thrusters of power level from 4kW to 6kW are at various stages of development for orbit raising of geosynchronous satellites. In that aspect, development of 5kW hall thruster was taken up to use the thruster for orbit raising of satellites from GTO to GEO. The same thruster can be de-rated to perform station keeping operations of the satellites. Design of the 5kW SPT was done by scaling up the mid-power level Hall thruster of 80mN thrust. After the design and realization of the thruster, testing was carried out for a cumulative duration of 115 hours. Test matrix includes the parameter optimization test, magnetic field optimization tests, voltage variation test, and power variation tests. Performance analysis and plume diagnostics, with intrusive and non-intrusive probes, were attempted for each of the test conducted. This paper reports the optimization of the thruster operating conditions and magnetic field optimization by measuring thrust and performing plume diagnostics using intrusive and non-intrusive probes. Also, the results of the power variation test, covering power level regime from 2 kW to 6.25 kW, which was achieved by changing only the flow rate, are also discussed. Results of Voltage variation test conducted at different power level are also included. At each power level i.e., 1 kW, 2.2 kW, 3kW, 4kW and 5 kW, anode voltage was varied and flow was set so as to keep the power constant. It also reports the throttling studies conducted to locate the stable operating regime of the thruster. These studies will serve as a foundation for characterizing the performance and defining the operating regime of the thruster.