IAF SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (2) (6)

Author: Dr. Vidhi Goyal
Bellatrix Aerospace Private Limited., India, vidhi@bellatrix.aero

Dr. Meenakshee Sharma
Bellatrix Aerospace Private Limited, India, meenakshee@bellatrix.aero
Mr. Rajesh Natarajan
Bellatrix Aerospace Private Limited., India, rajesh@bellatrix.aero
Mr. Rohan M Ganapathy
Bellatrix Aerospace Private Limited., India, rohan@bellatrix.aero

FAR-FIELD PLUME CHARACTERIZATION OF IN-SITU 200W HALL EFFECT THRUSTER

Abstract

Plume characterization plays a crucial role to optimize and improve the efficiency and performance of Hall Effect Thrusters (HET). It is important to estimate the interaction between HET and spacecraft. It also provides vital experimental inputs for numerical models. Bellatrix Aerospace has been carrying out extensive research on different types of electric propulsion systems and in-house plume diagnostics for the last 6 years. In the present work, far field plume of 200W HET (Arka-200W (TM)) is fully characterized at inhouse facility of Bellatrix Aerospace. A combination of our indigenous Faraday Probe (FP), RPA and Langmuir Probe (LP) is used to determine far field plume properties. Azimuthal measurements are recorded at +/- 90 degrees off central axis within a distance of 450 mm to 600 mm from thruster exit. Ion current density, plume divergence angle, ion energy distribution function (IEDF), plasma potential, floating potential and electron temperature are measured and calculated for various operating parameters. Results show that most of the ion energy is concentrated in the core within +/- 45 degrees off central axis but presence of CEX low energy ions is evident for larger angles. Plume divergence is less than 40 degrees during optimized operation. Electron temperature is maximum at Central axis and sharply decrease in radial directions. Signature of few 10s of kHz breathing mode oscillation is present in anode current and reflecting in diagnostics data as well. A thorough analysis of discharge current, voltage and diagnostic data is carried out and their mutual correlation is established. Detailed results and understanding of fundamental processes will be presented and discussed.