Paper ID: 78567
oral

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

Author: Ms. İLKSEN BURAT
TUBITAK Uzay, Space Technologies Research Institute, Türkiye, ilksen.burat@tubitak.gov.tr

Mr. Yusuf Yurttas
TUBITAK Uzay, Space Technologies Research Institute, Türkiye, yusuf.yurttas@tubitak.gov.tr
Mrs. Seda Kayra Gullu
TUBITAK Uzay, Space Technologies Research Institute, Türkiye, seda.gullu@tubitak.gov.tr
Dr. Baris Cal
TUBITAK Uzay, Space Technologies Research Institute, Türkiye, baris.cal@tubitak.gov.tr

THRUST LEVEL CHARACTERISTICS AT DIFFERENT XENON FLOW RATES

Abstract

Electric propulsion systems are gaining more importance in space systems due to their lower propellant mass, longer lifetime and more specific impulse against the conventional propulsion systems. Most of the satellites includes electric propulsion systems for orbit controls, station-keeping maneuvers, orbit corrections and collision avoids. TUBITAK UZAY is the pioneer of the research and development of the electric propulsion system in Turkey and started the Hall Thruster Propulsion System (HALE) project at 2010 with the support of the Ministry of Development. The aim of the project is to develop a Hall Effect Thruster (HET) and install a very first test facility in Turkey. The project is completed by the end of 2018 and Turkey's first laboratory model Electric Propulsion System is developed. With the basis of this project, two different types of thrusters, one of which is 1.5 kW thruster used for the GEO space mission project called TURKSAT6A-telecommunication satellite and the other is 300 W thruster used for the LEO observation satellite, have been developed. Different models of these two types of thrusters have been subjected to the test campaigns indicated in ECSS standards. The purpose of this study is to investigate the thrust levels of the HET with different Xenon flow rates in Electric Propulsion Laboratory at TUBITAK UZAY. The tests are performed inside a high vacuum chamber with a pressure level in the order of 10-7-10-8 Torr. Thrust measurements are done with the help of an inverted pendulum type thrust stand integrated inside the vacuum chamber. Plume measurements are carried out with Faraday probes decorated on a semi-circular plate rotating 180 around the thruster and collecting data at each 1. Xenon gas is given to the system at different flow rates by computer-controlled flow control devices. In this work, the behavior of the thrust levels will be analyzed changing the flow rates and hence the plume measurements with respect to the thrust levels. With the engineering model of 1.5 kW thruster, thrust measurements were taken for different xenon flow values and plume distribution was plotted. To make these measurements, the thruster mounted in the vacuum tank (Angelantoni - HVT14000) is integrated into the flow control devices located outside the vacuum tank with appropriate piping. Xenon was transmitted to the thruster at different flow values by computer-controlled flow control devices; accordingly, the thrust value created by the thruster was measured and the plume distribution was recorded.