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THE DESIGN AND PERFORMANCE OF THE LIPS-100 THRUSTER

Abstract

After 40 years of development, ion propulsion systems in Lanzhou Institute of Physics (LIP) are now being used increasingly for a wide variety of aircraft missions. A 10cm diameter xenon ion thruster named LIPS-100 ion thruster is under development at LIP to provide drag-free control of the gravity gradient satellite and North South Station-Keeping (NSSK) of high-resolution GSO satellites in super low orbit. The thruster is still at an engineering model level, and it takes innovations in design, materials compared to those conventional ion thrusters in LIP, and can work in two modes: 0.415mN variable-thrust conditions and 20mN constant-thrust conditions. The thruster was subjected to an operation test, a beam divergence test and a vibration test. In the test, the thruster was operated stably at the thrust of 15mN and 20mN, and performance data for the thruster were obtained over a 0.4-15.5mN envelope using an alternative throttling scheme. And the beam divergence was 10 achieves with the target of less than 12.5. The thruster include accelerator system and hollow cathode were conducted to random vibration at 13.6Grms for 2minutes in each of three orthogonal axes, and successfully passed the vibration test. To date, the study of the thrust control algorithm and thermal design for LIPS-100 ion thruster are now in progress. Based on the successful results of vibration test and performance test, the LIPS-100 ion thruster greatly contributes to the technological development of LIPS -100 ion propulsion system (IPS).