

SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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EXPERIMENTAL RESEARCH OF RADIO-FREQUENCY ION THRUSTER

Abstract

The paper is devoted to the experimental study of low-power (300 W) radio-frequency ion thruster designed at the Moscow Aviation Institute in cooperation with the JSC KBKhA. The main results of experimental testing of the thruster operating from the bench power supply unit and from the prototype of the power processing unit developed by the Educational Research and Production Center FRELA MAI are presented. Influence of the gas discharge chamber shape and material on the integral thruster performance was studied. The hemispherical discharge chamber demonstrated the best performance. Dependence of RF power input in the discharge on the propellant mass flow rate was studied experimentally at the constant levels of the ion beam current and voltage between the electrodes of the grid system. Variation of the basic integral characteristics during the thruster warm-up was analyzed. Procedure for thruster starting using the cathode-neutralizer was perfected and the influence of the cathode-neutralizer on the operation of thruster and its power supply and control systems was investigated. Recommendations for optimizing the basic thruster performance were developed based on the results of experimental research. The possibility to develop a flight model of the low-power radio-frequency ion thruster with the thrust of 8 mN and specific impulse of 3500 s on the basis of the designed experimental model was verified. It is planned to produce such flight model at the production facilities of KBKhA (Voronezh).