Paper ID: 56836
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IAF SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (1) (5)

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LABORATORY TESTS OF 10.5 KW HALL THRUSTER AND 42 KW CLUSTER

Abstract

The results of laboratory tests of an engineering model of KM-10 Hall thruster and 42 kW cluster are presented in this paper. The thruster is designed with a high specific power equal to 0.9 kW/kg, near-zero ceramics erosion and a low cathode flow rate equal to 3.7% of the anode flow rate. All the laboratory tests including parametric operation tests, anode flow rate uniformity measurements, plume divergence measurements, mechanical test, climatic test were successfully passed. Mechanical tests included the shock test with 1000 g overload. The cluster has also passed the full scale mechanical test, however without shock test. The laboratory tests have shown that the total efficiency of the KM-10 thruster is approximately the same as the analogues one but the structure of the efficiency is slightly different: the total specific impulse is higher and the thrust is slightly lower than ones were shown by other thrusters with magnetic shielding. The result was achieved using external layer technology instead of magnetic shielding technology. Along with that, 500-hour wear test with discharge voltage of 500 V and input power of 10.5 kW has shown that the ceramics erosion rate of the KM-10 thruster is near-zero and pole covers erosion rate corresponds to the service life of at least 10000 hours. Also, a cluster of 4 KM-10 thrusters with a total power of 42 kW was developed and testified. The operating tests and plume divergence measurement of a 42-kW cluster have shown that the mutual influence of the thrusters is negligible.