

THRUST CHARACTERISTICS OF MICRO PULSED PLASMA THRUSTER FOR NANOSATELLITES

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The paper deals with the development micro pulse plasma thruster. Currently, the number of launches of nano and micro satellites is growing [1]. This is facilitated by their low price and mass. For example, a 3U CubeSat is a satellite with sizes 30x10x10 cm and a mass of about 4 kg. At the moment, the majority of satellites are not equipped with a propulsion system. The presence of the thruster will help to expand the number of available missions and to prolong the life of the satellite [2].

The main principals of electrical propulsion systems are that stored electrical energy is converted into kinetic energy of propellant. This occurs during flashover on the dielectric surface (propellant). The resulting plasma has fairly high velocities. The thruster consists of 2 main parts: a high-voltage pulse generator and a discharge gap. A coaxial discharge gap with an anode-cathode distance of ~ 1 mm was used in experiments. The high-voltage pulse generator weighs about 60 g and operates from 5 volts and consumes 2-3 watts.

The main purpose of the work is to measure the thrust depending on the operating mode of the thruster. The first mode is when short high-voltage pulses (4-5 kV, 1-2 kHz) are directly applied to the discharge gap. The second, the voltage multiplier is connected to the output of the transformer (10 kV 60-120 Hz). The thrust was measured with a torsional pendulum, by measuring the oscillation amplitude of the pendulum after a series of impulses.

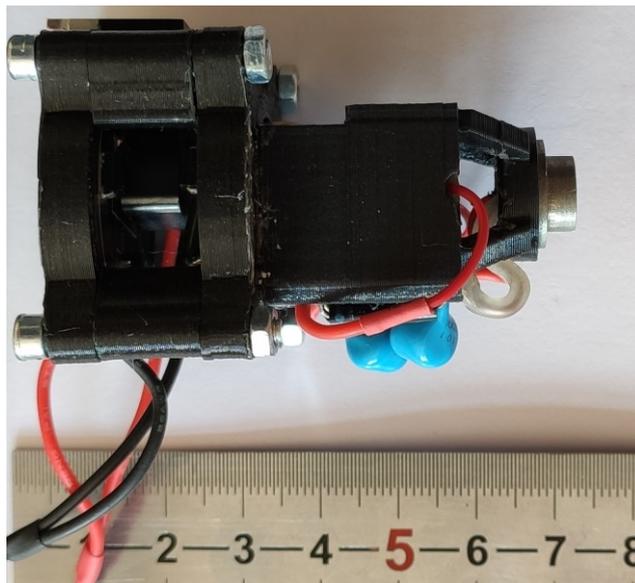


Fig.1. Photo of a thruster prototype.

REFERENCES

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- [2] I. Levchenko, et al, "Perspectives, frontiers, and new horizons for plasma-based space electric propulsion", *Physics of Plasmas* vol. 27, Article Number 020601, Feb. 2020.