Belarusian State University
of Informatics and Radioelectronics
R&D Department
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Electrostatic colloidal microthruster for small spacecrafts of CubeSat format

Type of collaboration

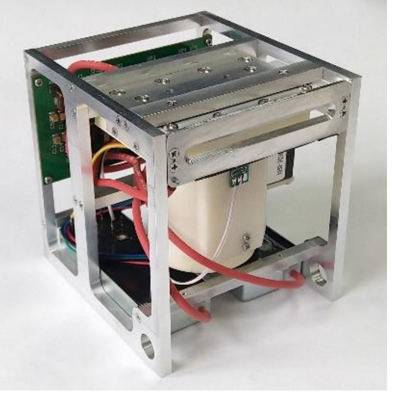
technical cooperation / research cooperation

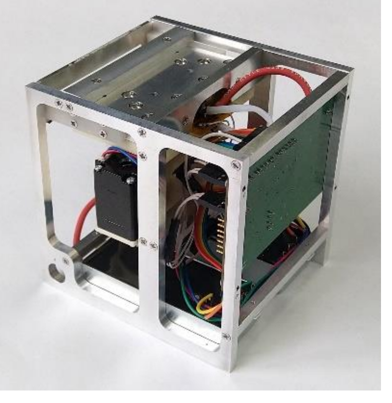
Key words

microthruster, nanotechnologies, cubsat, nanosatellite, microsatellite, aerospace

State of IPR

Patent applied,
but not yet granted





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Role of a partner

- Pilot operation of an electrostatic colloidal microthruster.
- Improving the developed manufacturing technology and design of the microthruster and/or to create devices with the required parameters.
- Development of new technologies for the use in microthruster of small spacecraft propulsion systems.

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Project description

The University has developed an electrostatic colloidal microthruster for nanosatellites, in which an ionic liquid is used as a fuel, providing a thrust of up to 0.2 mN at a total pulse value of 1000 N*s. The power consumption is 15 W. The dimensions of the microthruster are 100x100x90 mm, which does not exceed the dimension of one 1U CubeSat unit.

The advantage of this development is the use of MEMS technologies to create the main components of an electrostatic colloidal microthruster. This allows one to lower the standards for machining accuracy, hardness and viscosity of the structural materials used. As a result, it allows to achieve parameters similar to competitive developments with reduced cost of manufacturing and materials.

The dimensions of the developed microthruster sample make it possible to install it on CubeSat microsatellites with dimensions from 3U to 9U.

Low power consumption for the use of an effective electrostatic principle of reactive thrust formation enables to reduce the load on the onboard power supply system of the microsatellite.

In contrast to solid-fuel or liquid-propellant combustion thrusters, the electrostatic operating principle of the microthruster allows more accurate control of the pulse generated by it and repeated restart thereof during the life cycle of a microsatellite. The generated thrust and specific pulse allow maintaining the orbit of a 3U microsatellite with a height of 300 km for 3...4 years.

Advantages of the development

The materials used and MEMS technologies allow one to decrease the cost of the microthruster in comparison with the analogues that use heat resistant hard alloys, such as inconel, for the manufacture of similar components – the emitter and extractor. The required processing accuracy of 1...10 microns is achieved through the use of expensive high-precision milling and cutting machines.