SPACE PROPULSION SYMPOSIUM (C4)
Advanced Propulsion : Non Chemical, Non Electric (6)

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RECENT ACHIEVEMENTS IN THE DEVELOPMENT OF THE MOA THRUSTER, A HIGH PERFORMANCE PLASMA ACCELERATOR FOR SPACE AND TERRESTRIAL APPLICATIONS

Abstract

More than 60 years after the late Nobel laureate Hannes Alfvén had published a letter stating that oscillating magnetic fields can accelerate ionised matter via magneto-hydrodynamic interactions in a wave like fashion, the technical implementation of Alfvén waves for propulsive purposes has been proposed, patented and examined for the first time by a group of inventors.

The name of the concept, utilising Alfvén waves to accelerate ionised matter for propulsive purposes, is MOA – Magnetic field Oscillating Amplified thruster. Based on computer simulations, which were conducted to get a first estimate on the performance of the system, MOA is a corrosion free and highly flexible propulsion system, whose performance parameters might easily be adapted in flight, by changing the mass flow and/or the power level. As such the system is capable to deliver a maximum specific impulse of 13116 s (12.87 mN) at a power level of 11.16 kW, using Xe as propellant, but can also be attuned to provide a thrust of 236.5 mN (2411 s) at 6.15 kW of power. First tests – that are further described in this paper – have been conducted successfully with a 400 W prototype system at an ambient pressure of 0.20 Pa, delivered 9.24 mN of thrust at 1472 s ISP, thereby underlining the feasibility of the concept.

While space propulsion is expected to be the prime application for MOA and is supported by numerous applications such as Solar and/or Nuclear Electric Propulsion or even as an 'afterburner system' for Nuclear Thermal Propulsion, other, terrestrial applications, like coating, semiconductor implantation and manufacturing as well as steel cutting can be thought of as well, making the system highly suited for a common space-terrestrial application research and utilisation strategy. The terrestrial application scenario is backed up by recent tests, which have demonstrated the feasibility of the MOA system for high throughput/low target temperature coatings on sensitive materials.

This paper presents the recent developments of the MOA Thruster RD activities at QASAR, the company in Vienna, Austria, which has been set up to further develop and test the Alfvén wave technology and its applications.