

SPACE PROPULSION SYMPOSIUM (C4)
Interactive Presentations (IP)

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DEVELOPMENT OF LOW POWER ELECTRIC PROPULSION SYSTEM FOR MICRO-SATELLITES

Abstract

In recent years there is an increasing worldwide interest in orbit transfer using electric propulsion as the demand for all-electric telecom satellites is growing. Similarly, it is appealing to utilize electric propulsion to compensate for LEO launcher limitations by orbit raising the satellite to higher altitude LEO orbits. RAFAEL is currently developing the Micro-satellite Electric Propulsion System (MEPS), a low power system (150 – 300 W), in cooperation with Alta (Italy). This program is performed in frame of cooperation between the Israeli Space Agency (ISA) and the European Space Agency (ESA). All of the system components are based on gained knowledge and experience in electric propulsion system development. The Propellant Tank Assembly (PTA) and Propellant Management Assembly (PMA) are based on the space-qualified VENUS platform [1], paired with CAM200, a flight derivative of the CAMILA Hall effect thruster, developed in cooperation with the Asher Space Research Institute (ASRI) at the Technion [2]. The PMA and PTA incorporate space qualified components, industrial COTS components and in-house developed products, resulting in low overall dry mass of less than 16 kg and low cost. PMA components may be dispersed on a designated plate or enclosed in a designated case, allowing customization for various satellite platforms. In addition, RAFAEL is assisting other MEPS project members with the development, architecture and system engineering of the Power Processing Unit (PPU), based on previous experience with the VENUS project. The CAM200 Hall effect thruster, designed, manufactured and tested at RAFAEL, is currently at an Engineering Model (EM) level and has completed firing tests, resulting in measured thrust between 5 mN and 16 mN, specific impulse between 800 sec and 1400 sec and system efficiency between 20% and 40%. Future work will include completion of a Heaterless Hollow Cathode development, system integration, testing and qualification. [1]. A. Warshavsky, L. Rabinovitch, D. Reiner, J. Herscovitz and G. Appelbaum, Qualification and Integration of the Venus Electrical Propulsion System, ESA Space Propulsion 2010 Conference, San Sebastian, Spain, May 3 – 6, 2010. [2]. A. Kapulkin, V. Balabanov, M. Rubanovich, E. Behar, L. Rabinovich and A. Warshavsky, CAMILA Hall Thruster: New Results, 32nd International Electric Propulsion Conference, Wiesbaden, Germany, September 11-15, 2011, IEPC-2011-046.