

IAF SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (2) (6)

Author: Dr. Francesco Battista
CIRA Italian Aerospace Research Centre, Italy

Dr. Daniele Ricci
CIRA Italian Aerospace Research Center, Capua, Italy
Dr. Marco Invigorito
CIRA Italian Aerospace Research Centre, Italy
Mr. Antonio Smoraldi
CIRA Italian Aerospace Research Centre, Italy

MSVC: CIRA NEW SPACE SIMULATOR DEDICATED TO ELECTRIC PROPULSION

Abstract

Electric Propulsion (EP) is attracting a significant interest as primary or secondary propulsion applications for a large number of space missions. The development of brand new configurations, conceived both for very high power classes or very low ones, as well as consolidation of present technologies require huge efforts in terms of characterization and qualification phases before the integration in the space applications. In fact, the industrial development of such electric thrusters relies on the availability of suitable test facilities where on-orbit operations can be simulated with reliability. Furthermore, the availability of advanced infrastructures helps the study of the involved basic physical phenomena, supporting the development of theoretical, numerical and design procedures, required to optimize thrusters and components, and also investigations on the interaction between propulsion systems and spacecraft. Given this background, CIRA has recently established the IMP-EP Project. One of the goal is represented by the realization of facilities, featured by adequate sizes for both low power and high power class of thrusters and equipment such to enable tests of next future electric propulsion systems. In this way, RD activities in this strategic field will be implemented, starting from Hall Effect thruster technology. The development plan includes the realization of two facilities, devoted to RD purposes and characterized by different sizes. The one, dedicated to thrusters up to 5 kW power class, has been recently started up: it is named Medium Scale Vacuum Chamber (MSVC) and is characterized by diameter of 2 m and a length of 4 m). The space simulator, provided with a pumping system able to achieve a speed of 75,000 l/s (Xe) and an operating pressure of 4×10^{-5} mbar (@15 mg/s of Xenon), is fully operative from January 2020. A brand-new laboratory engine (named CRHET-250), has been specifically designed and realized in order to perform tests in the new simulator. It is a Hall Effect Thruster, fed-up by Xenon and characterized by a nominal power and thrust values equal to 250 W and 11 mN, respectively. The present paper gives an overview of CIRA development plan on EP projects and includes the goals achieved on MSVC facility start-up and preliminary test phases as well as the development line regarding laboratory thrusters testing.