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RESEARCH ON ELECTRIC SPACE PROPULSION AT ITALIAN AEROSPACE RESEARCH CENTRE: STATUS AND FUTURE ENHANCEMENT

Abstract

Electric Propulsion (EP) is considered a key technology for applications in present and future space missions.

Primary propulsion systems, based on Electric Propulsion (EP), are already adopted for several applications from high altitude orbit raising to orbit transfer missions, or, for example, until interplanetary scientific missions, requiring high impulse characteristics.

The present paper gives an overview of CIRA efforts within EP framework with a specific focus on the achieved goals, ongoing activities and future enhancement.

CIRA aim at joining the EP scientific community and enabling cooperation programs, by developing state-of-the-art testing capabilities in order to promote Italy as one of the European reference nations for electric space propulsion.

The development plan started with the realization for the first EP facility (MSVC – Medium Scale Vacuum Chamber, ¡ 5 kW) oriented to low power thrusters, considering Hall Effect based motors as the reference technology in the early phase. The start-up activities are on on-going and experimental activities on laboratory test articles are currently underway.

In parallel, a first impulse has been given to the first implementation of design and modelling activities with the aim of developing capabilities for the complete electric propulsion systems.

A constant updating of the facility is currently on-going to keep the testing performance always aligned with the possible new test standards. In particular, improvements in test operations sub-systems as well as plasma and optical diagnostics are planned. Moreover, a small chamber dedicated to cathode development has been conceived.

Next challenge will be the realization of the high power EP test facility (named LSVC – Large Scale Vacuum Chamber, ¿ 25 kW) designed to test high thrusters and even complete high power electric propulsion systems. LSVC will allow to significantly improve the present Italian and European testing capabilities. A facility as large and advanced as LSVC will allow to respond to the challenging requirements, demanded by the next future development lines of high power EP thruster.