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OVERVIEW OF ELECTRIC PROPULSION ACTIVITIES AT SITAEL

Abstract

SITAEL heritage in electric propulsion dates a few decades back and covers different thruster devices operating over a wide range of power levels and propellants. SITAEL also has an impressive laboratory area, with clean rooms, facilities for environmental tests, and more than fifteen vacuum chambers specifically designed for EP testing (including the European largest one).

Current activities are mostly focused on Hall Effect Thruster propulsion systems, where four thrusters have been developed and extensively tested to cover power levels between 100W and 20kW. Hall thrusters show great flexibility and can be used for a wide number of tasks such as orbit raising, attitude and orbit control, drag compensation, end-of-life disposal.

Low power propulsion devices (HT100 and HT400) are designed with special attention to cost and manufacturing processes, in order to be ready to serve the quickly expanding market of small satellites and large constellations. In the mid-power range (5 kW nominal), SITAEL is currently qualifying its own thruster, which implements a design based on a magnetically shielded configuration and is capable of working efficiently in a widespread power range (3-10 kW), both with xenon and krypton. The thruster is ideal for OR/SK of large geostationary platforms or for in-orbit servicing missions. In the high power range, SITAEL is working to consolidate its HT20k thruster operating at very high power (up to 25kW), targeting Mars and Moon cargo missions as well as space exploration. Last but not least, SITAEL propulsion team is actively working on the Air-Breathing Electric Propulsion (ABEP) concept, and in 2021 important test campaigns were carried out to characterize the beahviour of EP devices fed with mixtures of oxygen and nitrogen.

SITAEL develops the whole propulsion system, designing also the electronic units necessary to operate the thrusters. In this regard, special attention has been recently devoted to the possibility of adopting direct-drive architectures for the high power thrusters and to the optimization of the in-house designed Power Processing and Control Units for the low power thrusters.

The present paper gives a thorough overview of SITAEL recent and current activities in the field of Electric Propulsion, discussing all the abovementioned aspects.