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TEST CAMPAIGN OF A CUBESAT EQUIPPED WITH AN HELICON PLASMA THRUSTER

Abstract

The increasing interest in CubeSat platforms ant their capability of enlarging the frontier of possible missions impose technology improvements. Miniaturised electrical propulsion systems (ePS) enable new mission for multi-unit CubeSats (6U+). While ePS have achieved important level of knowledge at equipment level, the investigate the mutual impact of ePS and CubeSat technologies at system level risking to limit the application of this technology. The interaction between CubeSat and ePS should be assessed in terms of electromagnetic emissions (both radiated and conducted), thermal gradients, high electrical power management, surface chemical deposition, and quick and reliable data exchanges. This paper shows how a versatile CubeSat Test Platform (CTP), together with standardised procedures and specialised facilities (such as SPF at ESA-ESTEC) enable the acquisition fundamental and unprecedented information. Measurements can be taken both by specific ground support equipment placed inside the vacuum facility and by dedicated sensors and subsystems installed on the CTP, providing a completely new set of data never obtained before. CTP is constituted of a 6U primary structure hosting the ePS, avionic subsystems, batteries and mechanisms. Avionics are composed by an on-board computer for command and data handling functions, an electrical power system (PCDU and batteries, without solar panels), and a UHF communication board for housekeeping and experiment data transmission and command acquisition from ground where the operators can monitor the trend of any test phase. An Electric Propulsion Interface System (EPIS) was developed for the tests, constituted of a data logger system and a High power Management System (HPMS). Data Logger gathers data about radiation, thermal environment and power consumption with 40 temperature sensors, a line impedance sensor on the ePS power supply and ten radiofrequency modules. HPMS supplies up to 60W of power at regulated voltage to the ePS from dedicated batteries. CTP has already been integrated with SPF and the preliminary functional test campaign (in Figure 3 is shown the set-up) has been successfully performed, demonstrating the test

platform is ready for final tests that will be conducted in the second quarter of 2020 when the first ePS will be integrated in the platform and a complete functional test in vacuum chamber will be completed. The test campaign foresees the activation of ePS for a different time duration, managing nominal and off-nominal conditions.