SPACE PROPULSION SYMPOSIUM (C4)
Electric Propulsion (4)

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THE ALTA FT-150 FEEP MICROTHRUSTER: TEST RESULTS OF THE PRE-QUALIFICATION CAMPAIGN

Abstract

The development of the FT-150 FEEP micro-thruster was successfully completed by Alta: endurance testing confirmed that the updated thruster design is capable of performances dramatically improved with respect to previous FEEP configurations, marking a major step forward in the panorama of propulsion technologies available to space programmes such as LISA and NGO.

In preparation of the qualification campaign, planned to start by mid 2013 to be completed by end of 2014, a pre-qualification test campaign at sub-system level was carried out with the aim to verify the long-term coupling between any subsystem units as well as with the test set-up. The pre-qualification test campaign consisted, sequentially, in environmental testing (i.e. mechanical and thermal vacuum) followed by functional and life testing. The thruster was first integrated onto its dedicated structure and the sequence of sine and random vibration was applied. The full sine vibration levels for all axes were: 8.8 mm (0-pk) in the 5 to 21 Hz range and 16 g in the 21 to 100 Hz range. The random vibration applied an overall level of 10 grms in the in-plane direction and 12.6 grms in the out-of-plane direction, in the frequency range between 20 and 2000 Hz. The thermal-vacuum test was then performed, in non-operative conditions. The thruster was subjected to thermal vacuum cycles in the temperature range -26 C to +36 C. Preliminary visual inspections and functional verifications confirmed that the FT-150 FEEP micro-thruster had passed successfully both vibration and thermal tests. Finally, the FT-150 FEEP thruster assembly was dismounted from its structure and integrated in a dedicated vacuum facility to be subjected to functional and life testing, driven by a flight representative Power Control Unit provided by Selex Galileo. At present the life test is still on-going: the thruster has reached 1500 Ns of total impulse and

2800 hours of firing time.

The successful advancement of the pre-qualification test campaign shows that the FT-150 FEEP micro-thruster design is ready for qualification and that the FEEP technology can be taken into account as plausible candidate for future flight applications.

This article provides details and results of the pre-qualification test campaign.