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

Author: Dr. Alena Kitaeva
Sitael Spa, Italy

Mr. Stefan Gregucci
Sitael Spa, Italy
Mr. Andrea Di Sarli
Sitael Spa, Italy
Dr. Nicola Giusti
Sitael Spa, Italy
Mr. Luca Pieri
Sitael Spa, Italy
Mr. Vincenzo Pisano
Sitael Spa, Italy
Mr. Lucio Torre
Sitael Spa, Italy
Mr. Massimiliano Cecconi
Sitael Spa, Italy
Mrs. Caterina Binetti
Sitael Spa, Italy

SITAEL STATE-OF-THE-ART HIGH-POWER ELECTRIC PROPULSION

Abstract

The development of High-Power Electric Propulsion Systems (EPS) is ongoing at SITAEL in the framework of several European Commission, European Space Agency and Italian Space Agency programs as well as projects from private customers and internally funded activities.

SITAEL High-Power EP S/S are based on 5 kW (HT5k) and 20 kW (HT20k) Hall Effect Thrusters. This paper summarizes the current status of the HT5k and HT20k thrusters' development and the progress achieved within the associated programs toward the qualification.

The work presents the status of the SITAEL HT5k TU qualification and summarized the outcomes of the TU EQM coupling test with the fluidic system and power processing unit and the characterization of the TU with krypton. The overview of the activities performed on the other SITAEL High-Power Hall Effect Thruster HT20k are also presented including the results of the standalone krypton characterization and the coupling test activities in the framework of the ASPIRE EPS system development.

The HT5k TU EQM has already completed a number of pre-qualification tests including functional and ignition characterization with Xe and Kr, thermal-vacuum tests, mechanical tests, EMC test, 2000 cathode on-off cycles, more than 1400 h of endurance testing with Xe. Successful coupling with the external and internal cathodes has been achieved with Kr propellant verifying the possibility of the double cathode solution and increasing the TU reliability and lifetime. Currently the TU QM development is ongoing with full qualification foreseen before 2025. A coupling test with the SITAEL PPU and a commercial XFC have been performed in 2023: the PPU will power not only the TU discharge, but also the auxiliary elements such as cathode heater and TU electromagnets as well as the keeper ignition in pulsed mode and XFC valves.

The HT20k EQM design has been completed and a coupling test with another commercial Fluidic Management System (FMS) and the direct-drive PPU have been performed in February 2024 using both Xe and Kr as propellant. Moreover, a HT20k characterization with Argon has been performed.