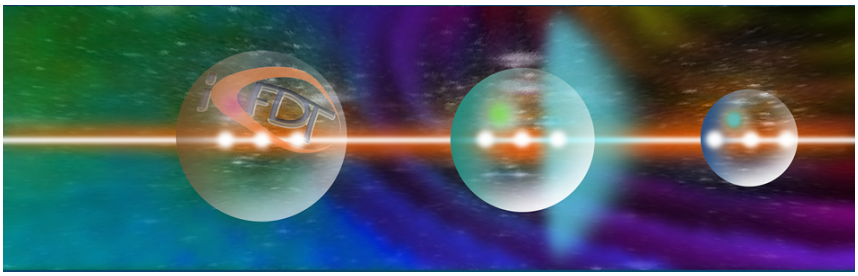

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# Plume Characterization of a High Current LaB6 Hollow Cathode

*Thursday, October 4, 2018 2:30 PM (1h 30m)*

Lanthanum hexaboride hollow cathodes have been the prime choice for high power Hall thruster applications, under development for the next generation of manned and robotic interplanetary missions. In this scenario, SITAEL is actively developing high current hollow cathodes capable of providing discharge current in the range 10-100 A to be coupled with high power Hall thrusters.
Despite the application of hollow cathodes on flight and laboratory model Hall thrusters, many unsolved questions still remain. In particular, topics related to onset of instabilities, due to plume mode or ion acoustic turbulence, are still unclear, while it is known that they can affect the overall performance of the cathode and thruster unit.
This research focuses on the experimental investigation of the plume exiting the cathode by means of measurements of main plasma parameters, at different operative conditions and geometry.
The cathode subjected to the study, named HC60, can provide discharge current in the range 30-80 A, and it has been coupled with SITAEL HT20k, a 20 kW power Hall thruster. The cathode is made of a LaB6 cylindrical emitter in a refractory metal tube; it hosts heaters to warm up the cathode prior to ignition, and it is surrounded by an electrode named keeper, acting also as protective element.
The experimental campaign has been performed using triple Langmuir probes as plasma diagnostic system. The probes were mounted on scanning mechanisms capable of measuring the parameters of the plume at various radial and axial distances from the keeper exit. The HC60 was mounted in stand-alone configuration with a cylindrical anode to simulate the thruster unit environment, and it was placed in a vacuum facility suitable for cathode testing.
The analysis on the probes measurements and the resulting plasma parameters are presented. General trends of electron temperature, plasma potential and plasma density are evaluated in terms of discharge current, mass flow rate and orifice geometry. The results highlight stable operative conditions of the cathode in the current range required by the thruster.

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