

## IAF SPACE PROPULSION SYMPOSIUM (C4)

## Electric Propulsion (4)

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## DESTRUCTIVE EVALUATION OF A XENON HOLLOW CATHODE AFTER A 15,000 HOUR LIFE TEST

**Abstract**

The LIPS-200 20cm ion propulsion thruster employs a LHC-5 type Lanthanum Hexaboride hollow cathode assembly (HCA) as both the discharge and neutralizer cathode. In order to demonstrate the lifetime capability of the HCA, a hollow cathode life test was performed. This test sought to verify LHC-5 type Lanthanum Hexaboride hollow cathode lifetime capability and early failure mechanism. The cathode was operated at the LIPS-200 design point of 1.4 A and 5.2 A discharge current and a xenon flow rate of 1.0 sccm during the 15,000 hours and 7,500 ON/OFF test. The cathode performance parameters, including discharge current, discharge voltage, keeper current, keeper voltage, and flow rate were monitored throughout the test. The life test was voluntarily terminated and the hollow cathode assemblies underwent Destructive Physical Analysis in order to investigate the physical and geometry change of a hollow cathode. Important subcomponent such like emitter, orifice plate, cathode tube, keeper assembly was analyzed by energy dispersive spectroscopy (EDS), scanning electron microscopy (SEM), X-ray photoelectron spectroscopy (XPS) to validate the erosion of these subcomponents. At last, the depth of emitter was measured to determine the remaining lifetime of the LHC-5 type Lanthanum Hexaboride hollow cathode.