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Development and Characterization of a LaB_6 Heaterless Hollow Cathode with an Open-Ended Emitter TRENTON R. BREWER, PRACHI L. JAIN, MATTHEW J. CARRIER, ALEX W. NIKRANT[1], COLIN S. ADAMS, Virginia Polytechnic Institute and State University — Hollow cathodes have been investigated as electron sources for plasma ionization and beam neutralization in electric thrusters since the 1960s. Heaterless versions have the potential to avoid the start-up times and power expenditures associated with external heating sources. A modular, low-current heaterless hollow cathode (HHC) has been developed to study operating mode transitions and sheath physics and to provide an electron source for a future electric thruster. The cathode operates in a triode configuration, consisting of an open-ended LaB_6 thermionic emitter, an orificed tantalum keeper, and a stainless steel flat-plate anode. Voltage and current characteristics recorded during operation with both argon and krypton gas show two distinct discharge modes. Plasma density and temperature in the region between the emitter and keeper are inferred from measured discharge current, emitter-keeper voltage, and mass flow rate using a current-conservation and power balance model.

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