# Plasma Generation Near an Ion Engine Discharge Chamber Hollow Cathode

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In gridded electrostatic thrusters, ions are produced by electron bombardment in the discharge chamber. In most of these thrusters, a single, centrally located hollow cathode supplies the ionizing electrons. The discharge chamber magnetic field restricts the electrons leaving the hollow cathode to a very narrow channel. In this channel, the high current density ionizes both propellant gas flowing through the hollow cathode, and and other neutrals from the main propellant flow from the plenum. The processes that occur just past the hollow cathode exit are very important. In recent engine tests several cases of discharge cathode orifice plate and keeper erosion have been reported. In this paper we present results from a new 1-D, variable area model of the plasma processes in the magnetic channel just downstream of the hollow cathode keeper. The model includes electrons as well as neutral, singly ionized, and doubly ionized xenon atoms. The electron energy equation is solved to balance Ohmic heating with ion production, radiation, convection, and conduction. First results show that there is region of high electron drift velocity just a few millimeters downstream of the keeper. In this region, electrons undergo rapid heating, and there is a strong electric field that accelerates ions back toward the keeper. The details of this region are shown to control discharge chamber hollow cathode orifice plate and keeper erosion.