Hollow cathode plasma electron source for beam generation

C.D. COTHAN, Global Strategies Group (North America), S.G. WALTON, R.F. FERNSLER, W.E. AMATUCCI, Plasma Physics Division, U.S. Naval Research Laboratory — The characteristics of an electron beam produced by extracting electrons from a hollow cathode plasma is described. The anode to cathode surface area ratio is less than the root of the electron to ion (Argon) mass ratio such that an electron sheath forms at the anode; a bias on this anode then accelerates the electron flux into a beam. A magnetic field assists the beam collimation. Paschen breakdown in the few Torr range at 500V initiates the hollow cathode plasma, and typical continuous operation is at 130mTorr with about 300V required to sustain the plasma at 60mA. Variation of the hollow cathode current allows direct control of the beam current. Continuous beam at up to 5kV and 80mA has been produced with this device.

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