

Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Vortex structures in relativistic magnetrons¹ JOHN DAVIES, JING ZHOU, CHIPING CHEN, Plasma Science and Fusion Center, Massachusetts Institute of Technology, Cambridge, MA 02139 — We showed recently the existence of vortex flows in the electron beam equilibria of magnetron structures consisting of a central cylindrical cathode and a periodically corrugated cylindrical anode [J. A. Davies and C. Chen, Phys. Plasmas 13, 012310 (2006)]. In this paper, we present a relativistic treatment of the equilibrium of a planar magnetron consisting of a planar cathode and a corrugated anode. The electron density in the electron layer is assumed to be constant, and guiding-center approximation is employed. Properties of the equilibrium such as the electrostatic potential, flow velocity, and the self-magnetic field are determined analytically. An interesting result of the present analysis is the appearance of vortex structures near the cathode. Test particle studies are carried out to identify the parameter regimes in which the guide-center approximation is valid. Progress in determining if these parameters regimes and our results are relevant to relativistic magnetron operation will be discussed.

¹Research supported by AFOSR.

John Davies
Plasma Science and Fusion Center, Massachusetts Institute of
Technology, Cambridge, MA 02139

Date submitted: 24 Jul 2007

Electronic form version 1.4