BUNEMAN-HARTREE CONDITION RE-VISITED

D. H. Simon, Y. Y. Lau, R. M. Gilgenbach
University of Michigan, Ann Arbor, MI 48109 USA

W. Tang, B. Hoff, K. L. Cartwright
Air Force Research laboratory, Kirtland AFB, NM, USA

John W. Luginsland
Air Force Office of Scientific Research, Arlington, VA, USA

The Buneman-Hartree (B-H) condition is re-examined in a cylindrical relativistic magnetron using both the conventional, single particle model, and the Brillouin flow model. These two models yield the same result for the Buneman-Hartree condition only in the limit of a planar magnetron. When b/a = 1.3, where a is the cathode radius and b ($> a$) is the anode radius, the difference in the two models becomes significant. When b/a = 4, the difference is acute, the Buneman-Hartree magnetic field, at a given voltage, in the Brillouin flow model exceeds four times that in the single particle model. Such a difference is always present, whether the voltage is relativistic or not. These results are quantified for $b/a >> 1$ using Davidson's model [1], conveniently cast in terms of the normalized gap voltage and normalized magnetic flux imposed on the cylindrical magnetron [2]. Comparison with experiments will be reported.

This work was supported by AFOSR, AFRL, L-3 Communications Electron Devices Division, and Northrop-Grumann Corporation.

[1] R. C. Davidson, G. L. Johnston, K. T. Tsang, and A. T. Drobot, in Proc. SPIE vol. 1061, p. 186 (1989).

[2] Y. Y. Lau *et al*., Phys. Plasmas (to be published).