Abstract Submitted
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A Study of Miram Curves in Thermionic Cathodes[1] ABHIJIT JASSEM, Univ of Michigan - Ann Arbor, YUE YING LAU, University of Michigan — The anode current vs. cathode temperature plot of a diode using a thermionic cathode is commonly known as the Miram [1] curve, and the transition from temperature to space charge limited flow is referred to as the 'knee' in the curve. The physical reasons behind the shape of the knee are significant because a thermionic cathode is almost always operated in the vicinity of the knee to improve cathode life. This paper presents a novel analytic model, which solves the Poisson equation in 3D assuming an infinite axial magnetic field, including an arbitrary work function distribution on the cathode surface [2]. An earlier version that solves the Poisson equation in 2D yields excellent agreement with the corresponding MICHELLE code results [3]. Our model points to the deficiency of the customary Practical Work Function Distribution model [1], and demonstrates the necessity of a large fraction of non-emitting area to yield a Miram curve with a smooth knee, as often observed in experiments [1]. [1] M. Cattelino, G. Miram. Appl. Surf. Sci., vol. 111, pp. 90-95, 1997 [2] A. Jassem, D. Chernin, S. Ovtchinnikov, J. J. Petillo, Y. Y. Lau. Proc. IEEE Int. Vac. Electron Conf. (IVEC), Monterey, CA, USA, 2020. [3] D. Chernin et al. IEEE Trans. Plasma Sci., vol. 48, no. 1, pp. 146-155, 2020.

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