Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

A higher-dimensional theory of electrical contact resistance WILKIN TANG, Y.Y. LAU, M. GOMEZ, R.M. GILGENBACH, J. ZIER, University of Michigan - Ann Arbor, M. HAWORTH, Air Force Research Lab, E. YU, M. CUNEO, T.A. MEHLHORN, Sandia National Laboratories — Electrical contact resistance is important to wire Z-pinches, high power microwave (HPM) sources, and carbon fiber field emitters, etc. It determines the amount of current delivered to the Z-pinch wire load, and good rf contacts are critical to HPM source development. The classic theory of Holm [1] assumes that the electrical contact has a finite area, but has a zero thickness in the direction of current flow from one region to the other to which electrical contact is to be made. In this paper, we use a simple geometry to calculate the resistance of an electrical contact that has a finite length in the direction of current flow. An analytic scaling law, to be developed, would then allow an assessment of the change in the contact resistance in response to an external force, whose presence would lead to a change of the contact geometry. This change may be related to the hardness of the materials. This work was supported by Sandia and AFRL.

[1] R. Holm, Electric Contacts (Springer-Verlag, 1967).

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Date submitted: 21 Jul 2007 Electronic form version 1.4