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Theory of Contact Resistance WILKIN TANG, Y.Y. LAU, R.M. GILGENBACH, M.R. GOMEZ, J. ZIER, University of Michigan - Ann Arbor — Electrical contact is an important issue for high power microwave sources, wire-array Z pinches, field emitters, and metal-insulator-vacuum junctions. Because of the surface roughness on a microscopic scale, true contact between two pieces of metal occurs only on the asperities of the two contacting surfaces. This gives rise to contact resistance [1]. We have developed a novel analytic theory of contact resistance of an asperity of transverse dimension (a) and finite axial length (h) connecting two metal blocks. For asperity of rectangular, cylindrical or funnel shape, we find that the contact resistance is of the form R[1+p(h/a)] where R is the corresponding h=0 "a-spot" theory limit of Holm [1] and Timsit [2], p has a simple form which we have verified against electrostatic code results. This higher-dimensional treatment links the contact resistance to the geometrical deformations in response to an applied pressure, and to the hardness of the material. This work is supported by Sandia, AFOSR, AFRL, L-3, and Northrop-Grumman. [1] R. Holm, Electric Contact (Springer-Verlag, 1967). [2] R. S. Timsit, IEEE Trans. Components Packaging Tech. 22, 85 (1999).

Wilkin Tang
University of Michigan - Ann Arbor

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