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A Theory of AC Contact Resistance

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Electrical contact is an important issue to high power microwave sources, pulsed power systems, field emitters, thin film devices and integrated circuits, and interconnects, etc. Contact resistance, and the enhanced ohmic heating that results, have been treated mostly under steady state (DC) condition. In this paper, we consider the AC contact resistance for a simple geometry [1], namely, that of two semi-infinite slab conductors of different thicknesses joint at z = 0. The conductivity of the two slabs may assume different values. In the DC case, this model was solved exactly by Zhang and Lau [1]. We have constructed an exact solution under AC condition, and we have shown that in the limit of zero frequency, our AC solution reduces to those of Ref. [1]. New features that accompany AC condition, such as the resistive skin effect, inductive, and capacitive effects, as well as radiation losses are explored.

[1] P. Zhang and Y. Y. Lau, J. Appl. Phys. 108, 044914 (2010).

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