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Negative AC Contact Resistance[1] YUE YING LAU, University of Michigan, FOIVOS ANTOULINAKIS, Univ of Michigan - Ann Arbor — Forty percent of all failures in electronic devices, from consumer electronics to large scale defense systems, are due to poor electrical contacts. Electrical contact resistance, and the enhanced ohmic heating that results, have been treated mostly under steady state (DC) condition. We consider the AC contact resistance for a simple geometry [1], namely, that of two long conductor slabs of different materials joint at $z = 0$. The contact resistance, also known as the constriction or spreading resistance, is defined as the difference between the total resistance and the sum of the bulk resistances from the contacting members. In the DC case, this contact resistance equals to zero when the two slabs have the same dimensions, in which case the current flow is uniform across the junction at $z = 0$, and the bulk resistance constitute the total resistance. At some frequencies, we found that the contact resistance can become negative, meaning that the total resistance is less than that due to bulk resistance [1]. The physical interpretation in terms of current spreading near the junction is given. New features that accompany the AC condition, such as the resistive skin effects, are illustrated. Scaling laws for the contact resistance as a function of frequency are constructed for several cases.

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