Abstracts

A Simple Formula for the Concentration of Charge on a Three-Dimensional Corner of a Conductor (Short Papers)

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A major problem in the computation of capacitance coeffi-cients for microwave transmission and VLSI interconnection systems is caused by the singularities in the electric field at the corners and edges of conductors. For edges, a solution is given by the Duncan correction, which is based on a two-dimensional (2-D) polar expansion of the field. No such exact expansion exists for corners. Recent research by Beagles and Whiteman has yielded an asymptotic expansion for the electric field in the vicinity of a rectangular three-dimensional conductive corner, and this is used to derive a simple formula for the charge Q (in coulombs) concentrated at any such corner. The formula is Q = 1.307epsilon d(V/sub c/-- V/sub zeta/) where epsilon is the dielectric permittivity (in farads per meter) of the medium surrounding the conductive corner, d is the length (in meters) of one side of a cubic region situated on the conductor adjacent to the corner, V/sub zeta/, is the electric potential (in volts) of the conductor, and V, is the electric potential at a point in the medium displaced from the corner's apex along a time through the cube's diagonal and at a distance eqmd to that diagonal. Q is the charge on the cube's three surfaces lying along the conductor's surfaces. Such a configuration is convenient for a finite-difference computation of capacitance.

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