

# Electromagnetic Near Fields as a Function of Electrical Size

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*Abstract*—The near fields of a radiating rectangular plate placed over and normal to an infinite horizontal ground plane have been analyzed as a function of the electrical size of the plate. Both vertical and horizontal currents are taken into account. Two different methods are used to compute the near fields. The variation of the electric field along the normal to the plate is studied in detail as a function of the electrical length  $L/\lambda$  of the plate. The electric-field magnitude decreases as distance  $r$  increases until an oscillatory region is encountered about one wavelength from the plate. Oscillations continue until distance is equal to  $L^2/4\lambda$ , or one-eighth of the usual far-field distance. The location of various minima and maxima can be predicted by a consideration of Fresnel theory. Comparison is made with the near fields of a circular aperture.

*Key Words*—Near field, plate over ground, size of plate.

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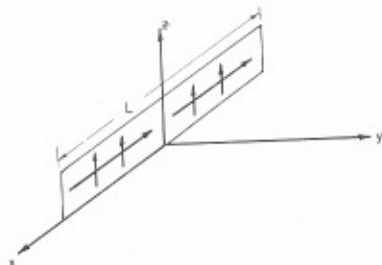


Fig. 1. A rectangular plate with vertical and horizontal currents over a ground plane.

Of particular interest is the vertical electric field (which is usually predominant) and its variation along the normal to the plate, since this is the direction in which the magnetic field