Study of near-zone fields of a small aperture

Yehuda Leviatan

Department of Electrical Engineering, Technion-Israel Institute of Technology, Haifa 32000, Israel

The structure or the near-zone field transmitted through an electrically small aperture in a perfectly conducting plane is investigated. We dwell on two issues that are of importance to engineers analyzing small aperture problems. The first question addressed is how far should one recede from the aperture in order to justifiably use the well-known aperture dipole approximations. Alternatively, how close may a source or a backing object be located without appreciably effecting the aperture quasistatic field distributions. The second consideration is to what distance the radiation emanating from the aperture remains collimated and how strongly is the near-field intensity dependent upon distance. The model used for our calculation is that of a small circular aperture for which the quasistatic aperture field distributions are analytically derivable. It is presumed that this should give an indication of the near-zone field characteristics to be expected in the general case.