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Weak penetration and radiation through apertures in conducting bodies of revolution

Korkut YEĞİN
Department of Electrical and Electronics Engineering, Yeditepe University,
Kayışdağı, 34755 İstanbul, TURKEY
e-mail: kyegin@yeditepe.edu.tr

Abstract: The simplest way to solve for penetration through small apertures in conducting surfaces is to treat the body as a scatterer and determine the interior field as the sum of the incident field and the scattered field contributed by the current induced on the surface of the body. However, it is well known that, if the aperture is very small or if the penetrated field is very weak this method yields very inaccurate results, which, in turn, prohibits proper design of electronic systems, especially for electromagnetic compatibility and interference. Previously, alternative integral equations formulations were proposed to remedy this problem and applied to two-dimensionalconducting cylinders with slots [1--2]. Application of these alternative techniques to three-dimensional conducting bodies of revolution (BOR) is studied in this work. In addition, the reciprocity principle is used to recast a weak penetration problem into a weak radiation problem, and it is shown that the alternative formulations useful for weak penetration are also useful for weak radiation. The important features and relative accuracies of each formulation together with numerical results are detailed for mock missile-shape structures.

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