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Analysis of scattering from structures containing a variety of length scales using a source-model technique

Eitan Erez
Kibbutz Ein Hashofet, Israel

Yehuda Leviatan
Department of Electrical Engineering, Technion—Israel Institute of Technology, Haifa 32000, Israel

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Fictitious source models have been applied extensively in recent years to a variety of electromagnetic and acoustic wave scattering problems. This paper is introducing an extension of the source-model technique that facilitates the solution to problems subsuming scatterers that contain a variety of length scales. This extension is in tune with the source-model technique philosophy of using simple sources the fields of which are analytically derivable. It amounts to letting the coordinates of some of the source centers assume complex values. Positioned in complex space, the simple sources radiate beam-type fields, which are more localized and are better approximations of the scattering from the smooth expanses of the structure. The coordinates of the other source centers retain their conventional real values. These latter sources are used, of course, to approximate the fields in the vicinity of the more rapidly varying expanses of the structure. The new approach is applied to analyze acoustic scattering from a structure comprising two adjacent pressure-release spheres of different size. It is found to render the solution computationally more effective at the expense of only a slight increase in its complexity.

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