A First-Order Approximation to Scattering from Thin, Curved Dielectric Structures

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Abstract

A first-order asymptotic approximation to scalar scattering from a curved thin dielectric object, or electromagnetic scattering from a two dimensional curved thin object, is presented. In order to solve the scattering problem, a Lippmann-Schwinger integral equation is derived from the governing Helmholtz partial differential equation. A space distribution of relative permittivity within the integral equation describes the scattering object. Using asymptotic analysis, the initial integral equation over the thin, curved three dimensional object is transformed into an integral equation over a two dimensional object, which approximately describes the thin, curved object. With the described transformation, computational time is significantly reduced since the dimensions of the scattering object are reduced by one. Convergence and an error estimate for the described first-order asymptotic approximation is presented.